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EVOLUTION AS AN AETIOLOGICAL FACTOR IN FOOT DISORDERS*

BY

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The most significant feature in man's recent evolutionary history has probably been the adoption of the upright posture, for there can be little doubt that as a direct and immediate consequence of the emancipation of the fore limb thus attained there arose an ability to explore with an unaccustomed precision, and later to utilize, whatever came within its range. This accurate examination of the surrounding world must have had a profoundly educative influence upon a brain already ripe for expansion, to which it responded in such degree that within a comparatively short geological period the skull capacity has had to increase fourfold in order to accommodate it. The rapidity (geologically speaking) with which the many adaptations of bodily structure and function necessary for permanent orthograde progression have appeared is a matter which deserves further consideration, for where change has been rapid it may be expected that stabilization will be more or less deficient and so variations of both structure and function will be frequent. The thesis of this lecture is that such variations may be mistaken for acquired pathological conditions, and may, indeed, in certain circumstances lead, as a result of failure of normal adjustment, to actual pathology. If we take the body as a whole the changes consequent upon the adoption of the upright attitude are considerable and widespread. They have possibly received too little attention; for the skeleton, the musculature, the pelvis, the thorax, the alimentary canal, the cardiovascular system—all are involved, both anatomically and physiologically, in greater or less degree. Many years ago Arbuthnot Lane applied these principles to the study of certain abdominal conditions and introduced some novel and intriguing ideas concerning the ways in which the effects of the change of gravitational axis on the support of the viscera are countered. Such conceptions are less popular than they were, but there is little doubt that his perception of the problem as primarily an evolutionary one is correct.

Demands of the Upright Mode of Progression

However this may be, the veriest novice would suspect that if any part of the body underwent more change than another in the adaptation of an originally pronograde animal for an orthograde existence it would be the foot, upon which all the demands of the new form of progression will fall. We can therefore study the human foot from this point of view with some degree of expectancy. If we possessed such complete details of the last million years of man's history as we have of some other animals—e.g., the horse—we could present a continuous picture, and our task would be an easy one. As it is, our knowledge must be obtained in devious ways, none of which is by any means exact, so that our deductions cannot be beyond criticism, and in many ways may be little more than a creed or working hypothesis. Our three chief sources of information are: from the sparse fossil remains of man's pre-human ancestors; from a study of the variations to be noted in the feet of the existing anthropoid apes to adapt them to terrestrial progression (we may reasonably assume them to be parallel to the changes in the pre-human foot); and from a study of the changes undergone by the individual human foot during its development, although it is recognized that great reserve must be exercised in comparing ontogenetic and phylogenetic changes. Here acknowledgment must be made to Keith, Le Gros Clark, Schultz, Gregory, Dudley Morton, Wood Jones, and others whose painstaking work has enabled us to piece together the somewhat scrappy story.

Adaptive Changes in the Foot

Since evolution is a continuous process there is no particular era at which man's evolution may be stated to have started, but for our purpose it will suffice to go back to the middle of the Cenozoic Era (possibly ten to twenty million years ago), when our ancestor was a comparatively small tree-dwelling monkey which by its habit of suspending itself by its arms from overhead branches (brachiation) was already initiating itself to the vertical posture, although its feet were not as yet used for weight-bearing in this attitude.

At this stage the foot was still a prehensile structure in which the outer four toes opposed the innermost to produce the grasp; it was therefore comparable to the foot of the average pronograde monkey of to-day. Perhaps it was the abundance of available food which led to a considerable increase in bulk; but, whatever the cause, by the middle of the Miocene Period there had evolved a number of large tree apes (*Dryopithecus*), of which there are many, unfortunately incomplete, fossil remains. For animals of such bulk the habit of brachiation becomes an impossible mode of progression, and so, with the retention of the upright attitude the feet were now forced to carry a large proportion of the body weight. When the final and permanent descent to the ground occurred it is difficult to say with accuracy; possibly it was earlier than is usually accepted, but the continued increase in the weight of the animal was surely the determining factor. The early shuffling gait of pre-man, like that of the present-day anthropoids, was certainly assisted by the use of the hands; but as time went on orthograde progression became more

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perfect, the hand was completely liberated, and the feet had to sustain all the stresses and strains connected with the carriage of the whole body weight (Fig. 1).

To enter into a full description of the anatomical and physiological changes which have accompanied this evolution would require much more space than is available, but if we limit our observations to a few of the outstanding points we shall nevertheless discover much of real practical significance. To begin with, the comparative size of the bones forming the various sections of the foot may be noted. Fig. 2 shows in outline the skeletal basis of the bones of the foot as we pass from the brachiating monkey to the completely orthograde human. It reveals the following changes: (1) the progressive reduction of the anterior section, made up of metatarsals and phalanges, and the corresponding increase in the posterior section—i.e., the tarsus; (2) the change in the relative lengths of the digits, especially the reduction of the dominant third digit of the pronograde type and the increase in the size of the first (great) toe in the human foot; (3) the gradual decrease in the abduction of the first digit and its final entire incorporation in the main structure of the foot; (4) the downward and backward extension of the os calcis to form a true heel, and, as an important corollary of this, the appearance of a longitudinal arch to the foot, for it is clear that without this disposition of the os calcis there would be no arch. In addition there is a notable increase in the general rigidity of the foot to fit it for its new purpose; this may be taken as a pointer to the type of extremity which the human foot is destined to become in the future.

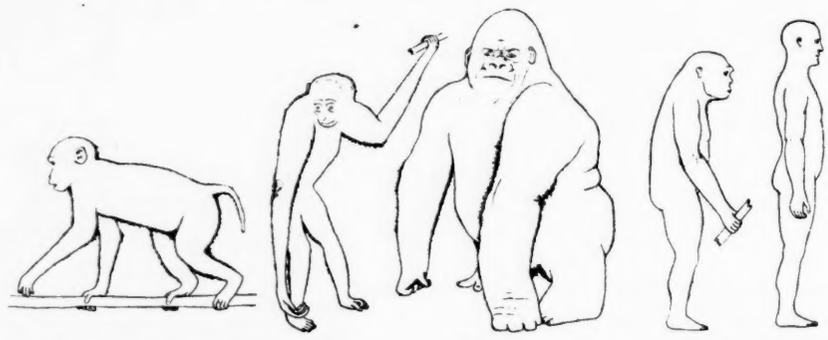

FIG. 1.—Phases in the adoption of the upright posture. Note how the centre of gravity falls progressively further back.

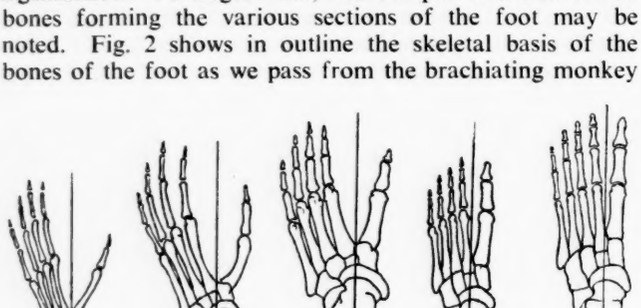

FIG. 2.—Skeletal basis, in outline, of the anthropoid series. The second human outline has been enlarged to equal in length that of the gorilla for easier comparison of the relative proportions of the bones.

Reasons for the Changes

Before inquiring into the practical import of these changes it will help if we attempt to discover the reasons for their appearance. They may be regarded, one and all, as adaptations towards the perfecting of upright terrestrial progression, specializations for one particular purpose at the cost of a great loss of general utility. And so from the point of view of complexity and delicacy of structure and function the human foot must be regarded as undergoing retrogression, except in so far as any part subserves orthograde progression. As the upright posture is more and more nearly achieved the centre of gravity falls progressively further back and the main stresses and strains are thrown on the posterior half of the foot, hence the increasing size of the tarsal bones. Complementary to this the anterior half becomes less important and undergoes relative diminution; but as the weight is at the same time transferred more to the inner side, the first toe does not share in the general process of absorption, and so in man comes to rival in its forward extension the second and third toes. In the stage of evolution reached at the present time there is, as might be expected, considerable variation in the relative lengths of these digits (Fig. 3), and, insignificant as these differences might seem to be on purely morphological grounds, in practice they assume importance because of the interaction of two other factors which have simultaneously occurred.

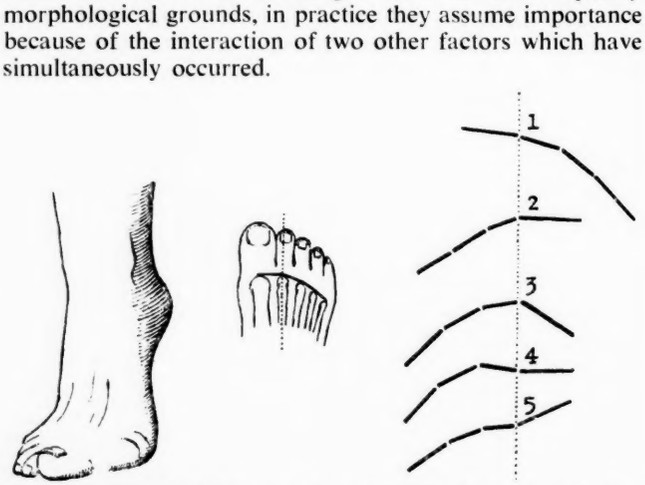

FIG. 3.—As the foot rises to the take-off position the weight is distributed to the metatarsal heads. Their conformation varies considerably in the human foot: a few examples of the "line of metatarsal heads" taken from radiographs of apparently normal feet are shown, to indicate the extent of the variation.

One of these factors is the incorporation of the first metatarsal and its digit into the general mass of the foot, a change consequent upon the loss of any need for prehension and opposition of the great toe as the foot became debased to a purely locomotor function. This means that the great toe, with its metatarsal, falls parallel to the others, and so differences in their relative lengths determine where the stresses will be thrown in a way that they do not when the first toe is independent of the rest of the foot.

The second factor becomes obvious when we consider the movements of the human foot under conditions of civilized life, for it is then recognized that these movements

are particularly stereotyped and quite unlike the variable movements of the feet of the anthropoid apes. That this is true is demonstrated very clearly by the observation that with an artificial foot having but two simple joints, one at the ankle and the other across the instep, the subject of an amputation can walk so well that it is often difficult to detect that there is anything unusual.

A further factor which is closely linked with the last and which tends to enhance the stereotyping of foot movements is the levelling of all surfaces with which the sole comes into contact, not only by the provision of roads, pavements, and paths, but even more so by the adoption of footwear, the rigid sole of which constitutes in effect an artificial level surface for the foot, which we carry with us much as a caterpillar tractor carries its own track to enable it to progress over rough ground. At the risk of unduly labouring this point it must be emphasized that these two factors are of aetiological importance in relation to certain foot disorders. Consider for a moment the unshod foot walking over an unprepared ground surface: at one step the ground contour is such that the weight is sustained by one part of the foot, at the next step by another. No two steps are alike, and so stresses are widely distributed among the bones and ligaments, etc. Under these conditions anatomical variations such as a long first or second metatarsal are unlikely to cause much trouble, but where each step is a precise repetition of that which went before, the stresses all fall repeatedly in the same places, so that small anatomical variations may have distressing consequences. This conception can be summarized thus: for the stereotyped movements upon prepared surfaces which upright progression in civilized life demands, the greatest efficiency will be exhibited by a foot which is also stereotyped—i.e., conforms to certain standard proportions. Such a type of foot is in the process of evolution in the modern human being, but has not yet attained its ultimate perfect adaptation for this purpose; its present form is therefore not stabilized, but is subject to anatomical (and functional) variations, some of which—e.g., short first metatarsal—render it unsuited for this mode of progression. Of course, a foot which is badly proportioned for stereotyped progression might nevertheless be efficient if employed quite naturally—i.e., unshod upon unprepared ground, conditions which practically never arise in a civilized community. This observation may dispel the doubts of those who find it difficult to credit that Nature's adjustments ever fall short of perfection; for the two artificial factors we have introduced (prepared ground surfaces and soled footwear) have been operative over much too short a time, say 4,000 years or so, for structural adaptation to have occurred, quite apart from the knowledge that civilization has completely disturbed the ordinary working of every form of natural selection.

Adaptation of the Foot to Civilized Life

Within the range of normal variations we can now examine what sort of foot is best adapted to the demands of civilized life; here we shall be guided not merely by the evolutionary indications already outlined but also by observations of the types of foot which most often fail to stand up to these demands. It seems that the great toe should take most of the strains of the "take-off" during walking; its bones and joints are relatively sturdy, and it appears on evolutionary evidence to be becoming the dominant toe of the foot. In a foot in which it is equal to or longer than the second and third it is able to perform this function perfectly, provided its incorporation into the rest of the foot has been sufficiently stabilized to prevent undue movement of the first metatarsal on the tarsus. But if, owing to the forward projection of the second and third metatarsals or to a defect in the stability of the first, the strains fall upon these weaker bones, painful callosities form under their heads and other secondary effects arise, including clawing of the toes and splaying of the foot as a whole. It will be recalled that the first metatarsal is provided with a sesamoid mechanism which enables the bone to rise to the take-off position while carrying the main portion of the body weight without undue friction, and particularly without any rolling movement which would displace the head forwards. When the weight falls upon the second or third, however, there is no such mechanism, and so the heads are rolled forwards, pushing in front of them the fibro-fatty pads on which the callosities develop, together forming a conspicuous feature of this type of foot.

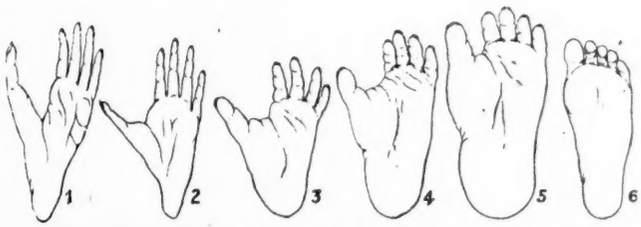

FIG. 4.—The gradual incorporation of the great toe into the rest of the foot. The accompanying longitudinal rotation is indicated by the position of the nails. (1) Macaque; (2) gibbon; (3) chimpanzee; (4) gorilla (lowland); (5) gorilla (highland); (6) human.

FIG. 5.

FIG. 6.

FIG. 5.—Radiograph of newly born infant's foot, showing abduction of the great toe and the wide space between that toe and the rest.

FIG. 6.—Footprint of an African native, aged 50, who had never worn footwear of any description. Note the well-marked hallux valgus, splay-foot, and obvious clawing of the toes.

At the same time, the proximal phalanx is forced into a position of dorsiflexion by the forward displacement of both the head of the bone and the fibro-fatty pads, the first stage in the development of clawed toes and hammer-toes. In these feet the radiograph shows a compensatory hypertrophy of the second metatarsal which confirms the above views.

Here, then, we have an example of a foot which on account of evolutionary maladjustment is a common cause of disability, for troubles other than those instanced can be traced back to the same origin; but we pass to the effects of the second evolutionary variation—namely, the degree of incorporation of the previously abducted great toe into the foot as a whole (Fig. 4). From this point of view the most satisfactory foot for stereotyped usage seems

to be one in which the incorporation has been as thorough as possible, making the first metatarsal rigid with the rest of the foot. When, through an evolutionary shortcoming, this fails of complete achievement we have a first metatarsal which is either somewhat abducted and unstable from birth (see Fig. 5) or readily becomes so when subjected to strain. Abduction of the first metatarsal may thus be regarded as something in the nature of an atavism, a point that tends to support this view being the accompanying rotation of the bone which places it in the same position as the opposable great toe of the anthropoids or the human thumb. For two reasons the phalanges are unable to follow their metatarsal into the abducted position: first, the structures attached to the base of the proximal phalanx on its lateral aspect—i.e., ligaments and adductor muscles—have undergone evolutionary retrogressive changes which leave them too short; secondly, no form of footwear, however rational, would allow an abducted position of the toe itself. And so the stage is set for the development of the common deformity of hallux valgus. That an evolutionary aetiology of this deformity deserves consideration is perhaps made clear by certain indisputable observations: (1) The condition occurs in those who have never worn other than perfectly rational footwear and in both sexes; (2) it is much commoner in women than in men, since high heels throw the stresses on to the anterior metatarsal region, so that any evolutionary tendency here will rapidly reveal itself; (3) it is often associated with hammer-toe, which we have already suggested is due to a similar evolutionary weakness (obviously with an abducted first metatarsal the strain of the "take-off" can be no more sustained by the head of that bone than it can when the bone is not properly stabilized, as described above); (4) the toe, with its nail, is often rotated in its longitudinal axis as in the anthropoids; (5) the deformity is met with in those who have never worn footwear (Fig. 6); (6) it is almost invariably associated with a splay-foot—i.e., a greatly increased width of the foot at the metatarsal heads.

The evolutionary theory of the aetiology of hallux valgus seems to be the only one which offers a complete explanation of all these facts, and incidentally of others that are not included here.

Development of the Heel

The third evolutionary feature to which attention must be directed is the development of a true heel and the general increase in the mass of the tarsal bones, with a simultaneous shrinkage of the skeletal basis of the anterior portion of the foot. These changes are inextricably bound up with the appearance of an "arch" to the foot. The question whether the arch (or, better, triangle) is to be thought of as a functional or an architectural feature of the foot is still hotly debated. It is impossible here to enter into this discussion, but my point of view is that the arch is a permanent architectural character resulting from the backward and *downward* extension of the os calcis which was determined by the adoption of the upright posture. However this may be, a comparison of the proportionate sizes of the tarsal elements as we pass from pronograde to orthograde types (Fig. 7) reveals without any possibility of misinterpretation the progressive increase in the mass of the heel bones. This is necessitated by the backward displacement of the centre of gravity, as is obvious from a glance at Fig. 1. The implication would seem to be that the human foot is designed to take the main stresses and strains, both static and dynamic, on the posterior half, and so any use of the foot which deliberately throws these strains forwards is acting in direct opposition to the indications of evolution. This is the real reason why high heels lead not only to considerable disability but also to many secondary deformities. A poor stance in which the centre of gravity falls through the anterior metatarsal region is equally likely to produce the same results.

From this it may be deduced that if one is compelled to stand upright and inactive (a circumstance to be avoided as much as possible, since it is entirely unnatural) the body should be so braced that the weight all falls on the heels, the fore part of the foot being used merely to keep the balance. This is a point to which those in charge of gymnastics, drills, etc., should pay attention. After prolonged and debilitating illnesses, operations, etc., the posture when the patient first gets up again is apt to be one in which the weight falls on the front of the foot, which, additionally weakened by the illness itself, is unfitted to sustain it and so splaying with all its consequences may result. Much the same state of affairs arises if the body weight increases rapidly, especially if the addition is abdominal, since, unless compensated for by lordosis, this also causes the centre of gravity to move forwards. It is of course true that there is normally a phase in walking when the heel is off the ground and the anterior section carries all the weight, and that this occurs equally in normal and abnormal feet, shod or unshod. This, however, does not nullify the above indictment, because in the unshod foot this action is intermittent, lasting for but a short period of the stride, whereas with a high heel the effect is maintained for a much longer period of each step. It is obvious that when we stand still a high heel or poor posture makes the effect a continuous one without respite, and this the foot is particularly incapable of sustaining.

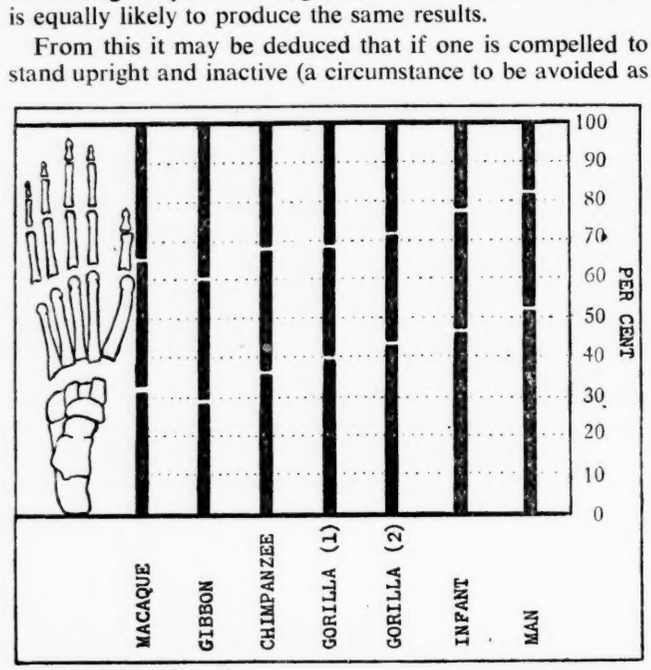

FIG. 7.—Diagram illustrating percentages of foot-length formed by tarsal, metatarsal, and phalangeal elements respectively. The range extends from completely pronograde (macaque) to completely orthograde (human) types.

Conclusion

We have considered but three of the evolutionary factors which play their part in the aetiology of foot disorders; there are many others which those interested might care to study, using as a guide their knowledge of the more recent events in the evolution of the human foot. My object has been to show by reference to the more outstanding examples that there is a definite influence of evolution on aetiology which may call for some revision of our accepted tenets. One sees in every branch of medicine—and foot conditions are no exception—the operation of a psychological trait which attributes every disturbance of bodily function to external factors and refuses to admit that there might be any inherent fault in the body itself.

The layman's ideas of aetiology certainly are practically always of this kind, the classical example being the mentally defective child whose parents attribute its defect to a fall out of a pram. No doubt from the point of view of human self-respect such an attitude is very admirable, but when searching for the truth we must recognize it for what it is—namely, a form of self-conceit. In the case of the feet it has become customary to place the blame for almost all disabilities and deformities (other than those patently congenital) upon footwear. That the form of the foot can be profoundly altered by restricting forces is not denied—the Chinese ladies' feet of a previous generation are sufficient evidence—nor is it proposed to exonerate the shoemaker entirely; but I feel that only when due consideration is given to such evolutionary factors as have here been instanced shall we get a true picture of the origin of many foot troubles or be able to explain their distribution among the population—well shod, badly shod, or even completely unshod. A well-developed foot, judged by evolutionary criteria, may stand up to considerable abuse, failing only when the maltreatment becomes excessive; but a badly adjusted foot may fail under the normal stresses of ordinary locomotion without any misuse whatsoever.

17-KETOSTEROID EXCRETION IN ADRENAL VIRILISM

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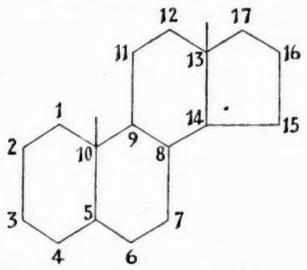
In an earlier publication (Broster *et al.*, 1938) we reported the results of a biochemical study in adrenal virilism and intersexuality. This was mainly concerned with the urinary excretion of androgens, and the qualitative and quantitative findings were based upon the capon method of assay of androgens. Since the completion of that work the introduction of a purely chemical procedure for the estimation of urinary ketosteroids has provided an alternative investigation method of great value in this field, with notable advantages over the biological method for the study of clinical cases, especially in regard to the ease of application and reproducibility. The enhanced facility thus afforded has rendered possible the rapid extension of our knowledge of a subject hitherto studied only with great difficulty. Such knowledge has already established some of the salient



features of adrenal virilism as they appear against a background of normal standards.

In the interest of the general reader it should be explained that the androgens—i.e., substances having male hormone activity—are derivatives of the parent hydrocarbon androstane, which has the skeleton ring structure indicated above. The term "17-ketosteroid" denotes steroid compounds like the two chief androgens of urine, androsterone and transdehydroandrosterone, which have a ketonic group in position 17. Now, it has been found that these two androgens, and certain related compounds of the steroid class all possessing the keto group in position 17, give an intense red colour with meta-dinitrobenzene and potassium hydroxide, such reaction making possible the rapid estimation of the urinary 17-ketosteroids. Because in addition to androgens certain other substances are included in this reaction which are not physiologically active, the colorimetric technique is not capable of giving an exact measure of the male hormone activity of the urine. Nevertheless the assay of the collective 17-ketosteroid has potentially as much interest as has the assay of that fraction which possesses biological activity.

Agreement is reasonably good among those investigators who have attempted to define the normal limits of androgen and ketosteroid output with which to compare findings in pathological cases. Thus Callow *et al.* (1939) give 1.7 to 12.6 mg. as the daily ketosteroid output for normal women, with a mean value of 6.75, and for men 3.5 to 15 mg., with a mean of 9.05. For androgens their values are 2 to 50 I.U. for women and 6.5 to 110 I.U. for men. These same authors review the findings of other investigators, which on the whole do not differ substantially from their own. Friedgood and Whidden (1939) quote 4 to 15 mg. as the daily excretion for normal women, while Chou and Wang (1939) report results in terms of body weight, obtaining values of 1 to 3 I.U. per kg., corresponding to an absolute range of 4.3 to 21 mg. daily. In sharp contrast to these scales, Callow and his fellow workers found outputs varying from 40 to 288 mg. of ketosteroid daily in adrenal tumour cases, while Friedgood and Whidden record figures from 45 to 325 mg., and various isolated tumour cases of which clinical and biochemical details have been published have shown similarly enhanced figures. In general these are of an order which appears to place adrenal tumour cases in a category entirely separate from all other pathological cases. A group of cases classified as "hirsutism, adrenal hyperplasia" investigated by Callow (1938) showed a range of 1 to 33 mg. ketosteroid daily, while in a somewhat similar group which was composed of cases of benign hirsutism and adrenal virilism, studied by Friedgood and Whidden, the range was from 1 to 29 mg.

While these investigations have provided the broad framework for an understanding of the significance of ketosteroid determinations in respect of adrenal cases, there remains much detail to be fitted into it. In particular the relation of ketosteroid excretion to the various types of adrenogenital virilism which have now been classified clinically calls for a closer study than has hitherto been attempted, and we therefore have endeavoured, with the aid of a considerable mass of clinical material placed at our disposal, to contribute further detail to existing knowledge.

Methods

For considerations of space only the briefest indication of the technical procedure will be given, as this paper deals essentially with results on clinical cases.

All ketosteroid determinations were made upon twenty-four-hour specimens preserved with either toluene or chloroform, 25 ml. aliquots being taken for an analysis. Hydrolysis was accomplished by boiling with 3% sulphuric acid for thirty minutes; and ether, or a mixture of equal volumes of ether and petroleum ether, was used for extraction. Purification of the ethereal extracts followed the usual lines, and the final product was taken up in 0.5 ml. of alcohol. For the purpose of colorimetric estimation 0.2 ml. of the alcoholic extract was treated

with an equal volume of 2% alcoholic solution of purified *m*-dinitrobenzene and 0.1 ml. 4N potassium hydroxide for one hour at 25° C., readings of the colour intensity being made in a Lovibond tintometer. The ketosteroid value was assessed from a calibration curve constructed from standard solutions of androsterone covering the range 20 to 200 γ (0.02 to 0.2 mg.) per 0.2 ml. In certain adrenal cases it was necessary to use suitable dilutions of the alcoholic extract to bring the colour intensity within the range of the calibration curve.

For the comparative capon assays of androgens four separate twenty-four-hour specimens were used, hydrolysis and extraction being carried out on each day's sample as soon as it became available. With the same acid concentration as for the ketosteroid determination the hydrolysis time was shortened to twenty minutes and ether extraction was again employed.

Ketosteroid Excretion in Normal Subjects

A series of estimations were made on normal female and male subjects to determine the approximate normal range with which to compare our pathological cases, and also the values obtained by other investigators. The "normals" included not only healthy individuals pursuing their ordinary vocation but also hospital patients convalescent from minor surgical operations. The findings are recorded in Tables I and II.

TABLE I.—*Ketosteroid Excretion in Normal Women*

Case	Ketosteroid Excretion mg. daily (S)	Creatinine mg. daily (C)	$\frac{100\ S}{C}$
1	7·0		
2	5·2, 4·6		
3	6·3, 5·7, 7·0		
4	10·0		
5	3·5		
6	6·4		
7	14·6	1,670	0·88
8	9·4	1,088	0·86
9	6·3	1,123	0·56
10	9·1	1,274	0·71
11	4·5	1,235	0·36
12	7·1	1,122	0·64

TABLE II.—*Ketosteroid Excretion in Normal Men*

Case	Ketosteroid Excretion mg. daily (S)	Creatinine mg. daily (C)	$\frac{100\ S}{C}$
1	13·7, 12·5 (30)		
2	12·5		
3	9·4		
4	11·9, 14·8		
5	9·7, 10·0 (48)		
6	12·6	1,706	0·74
7	18·6	2,293	0·82
8	9.4	2,043	0·45
9	20.9	2,560	0·82

Figures in parentheses denote androgen output expressed in I.U.

Where creatinine output has been determined it has been included in these tables, for such figures in relation to the ketosteroid output have a certain interest when compared with the corresponding findings in the series of secondary virilism cases which are to be considered later.

The range for women is 3.5 to 14.6 mg. daily, with a mean value of 7.4 mg. In calculating this mean we have used the average figure for those individuals whose output has been determined more than once. For men the range is 9.4 to 20.9 mg., with a mean value of 13.3 mg. Though the point has not been closely investigated, there seems, broadly, to be some relation between body size and ketosteroid excretion. The highest value in the female series, which greatly exceeded the next highest in the list, related to the biggest individual; while in the case of the men, too, the highest figures were encountered in the two biggest subjects. This observation derives some support from the creatinine figures, it having been long established that creatinine excretion has a certain parallelism with body weight.

In relation to the normal values it became of interest to ascertain whether in the adult female there were any appreciable changes during the menstrual cycle. In one subject on whom determinations were made throughout a complete cycle the ketosteroid output, as shown in Fig. 1,

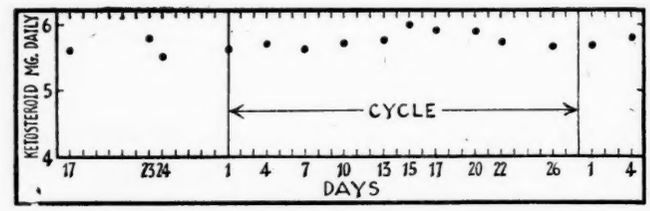


FIG. 1.—The ketosteroid output during the menstrual cycle of the normal adult female.

was found to keep at a fairly steady level. A slight peak occurs in the middle and a slight depression at the end of the cycle, but from this particular case at any rate there is no indication that any special day or time should be chosen in the determining of ketosteroid excretion in subjects of normal ovarian function. On the whole the ketosteroid excretion for any individual has been found to maintain a fairly even level from day to day, the occasional wide discrepancies occurring in the daily output having in most cases been traced to inaccurate collections of urine. The creatinine output has been found in such cases to be variable in the same direction and in much the same degree.

Ketosteroid Excretion in Adrenal Cases

By far the largest number of the cases examined were those of female subjects belonging to the clinical group of adrenal virilism. These have been arranged according to the following classification, previously adopted by Broster and Vines (1933): Group I, primary or pre-pubertal virilism; Group II, secondary or post-pubertal virilism; Group III, Achard-Thiers syndrome. Cases of adrenal tumour have been separately grouped, and the results in this class will be dealt with first. The findings are recorded in Table III.

TABLE III.—*Adrenal Tumour Cases*

Case	Sex	Age	Ketosteroid mg. daily	Androgen I.U. daily	Clinical Type
1*	M	1	28†	90†	Isosexual precocity
2	M	5	27		" "
3	F		170	800‡	Cushing's syndrome
4	F	34	270		" "

* Case published by Fraser (1940). † These values are per litre. ‡ Assay by inunction method.

The tumour cases comprise two distinct types: (*a*) two cases in young male children in which the tumour has given rise to isosexual precocity; and (*b*) two cases in women in which the clinical manifestations simulated those of Cushing's syndrome. The former gave much lower figures than the latter, which yielded the highest values for ketosteroid obtained in the investigation, with a correspondingly high value in the androgen excretion in one of these patients, the other not having been examined in this respect. Relative to the appropriate normal standards, however, the younger patients have quite as high an excretion as the adults. The only adequate control case we have had for comparison with the infant was a child, aged 20 months, whose excretion was so low that it could not be accurately

determined, but was less than 0.6 mg. per litre ; from which it was evident that Case 1 in this tumour group was excreting at least 45 times the normal amount of ketosteroid. Since normal children in the age group 5 to 7 excrete only about 0.5 mg. daily (cf. Nathanson, Towne, and Aub, 1939), the older child in the tumour group was excreting about 50 times the normal amount. Against these ratios the outputs of the adult members exceeded the average normal by 25 to 35 times.

Primary or Pre-pubertal Virilism.—The next group comprises 7 cases of primary or pre-pubertal virilism, the experimental findings being summarized in Table IV. The cases in this group, of which 4 have been submitted to unilateral adrenalectomy and the diagnosis of adrenal hyperplasia fully established, constitute the most interesting of all the virilism subjects in that in them the adrenogenital syndrome is present in its most complete form. The age range is from 7 to 18, those of a post-pubertal age having histories of virilism dating back to childhood. Ketosteroid excretion lies in the range 34 to 64 mg. daily, a range which might appear, on the basis of previously published results on adrenal cases, as characteristic only of adrenal tumour cases. Like the younger members of the previous group, the younger patients of this series exhibit a very striking enhancement of ketosteroid output in relation to the appropriate normal standards. Actually the youngest (Case 4, Table IV) shows about 70 times the normal excretion, those slightly older but still below puberty at least 20 to 25 times, which ratio falls to the level of about 6 to 8 in those examined at a post-pubertal age. However, it should be noted that two of these latter patients had previously been operated upon and one adrenal removed before we began examining ketosteroid excretion. One other case which cannot strictly be included in this group has, however, a close connexion with it, and indeed also with the previous group. The 9-years-old brother of Case 4 was found to be a fairly well marked case of isosexual precocity, thus resembling two of the earlier cases that have been mentioned. Clinical evidence and investigation could not confirm the presence of a tumour, but strongly suggested that his condition, like that of his sister, was due to pronouncedly hyperplastic adrenals. Three estimations of his daily ketosteroid output gave values of 60, 55, and 53 mg. From a consideration of the data just presented, it must be accepted that it is impossible in the pre-pubertal stage to differentiate between adrenal tumour on the one hand and adreno-cortical hyperplasia on the other solely on the basis of the urinary ketosteroid level.

TABLE IV.—*Primary or Pre-pubertal Virilism*

Case	Age	Ketosteroid mg. daily	Androgen I.U. daily	Remarks
1	9	52	109	
2	18	56		2 years' post-adrenalectomy
3	17	35	80	
4	7	37, 34	88	
5	18	54		1 year „ „
6	13	64	101	
7	9	50	101	

Secondary or Post-pubertal Virilism.—The remainder of our cases of clinical virilism, with one exception, fall into by far the largest group of the whole series, that of secondary or post-pubertal virilism. In all, 67 such cases have been investigated. As representative of the class as a whole, details of 21 consecutive cases examined about the mid-period of the investigation are furnished in Table V. The relation to normal of the whole of the ketosteroid findings obtained in this group is illustrated in the distribution diagram (Fig. 2). It will be seen that these cases cover a fairly wide range—from 6.4 mg. daily at the lowest to 33.4 mg. at the highest. Rather less than half the cases show findings clearly in excess of the normal female range. In the present state of our knowledge it is impossible to make any really satisfactory classification within this series. The only manifestation common to all is some degree of hirsutism of male distribution. Among them are several very mild cases, and doubt must exist as to whether some of these are really adrenal cases at all. Others show one or more additional features belonging to the full adrenogenital syndrome. On the evidence so far available it is

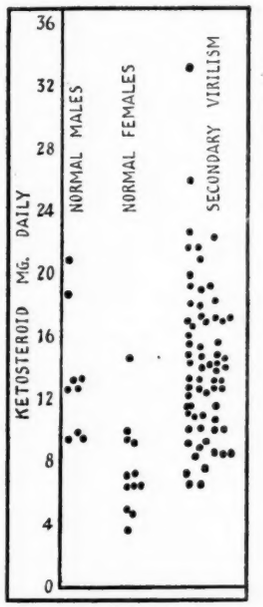


FIG. 2.—The ketosteroid findings in a group of 67 cases of secondary virilism compared with those of normal subjects.

TABLE V.—*Secondary or Post-pubertal Virilism*

Case	Age	Ketosteroid mg. daily (S)	Androgen I.U. daily	Creatinine mg. daily (C)	100 S / C	Clinical Notes
*1	32	10·8	80			Moderate hirsuties, scanty menses (A)
2	18	21·0	62	1,100	1·86	Mild hirsuties, irregular menses
		19·4				
		20·5				
		25·2				
		23·8		1,147	2·07	
3	25	19·4	82			Moderate hirsuties, amenorrhoea (A)
		25·9				
4	31	15·6		1,358	1·21	Marked hirsuties, obesity of Cushing type, normal menses
		16·4				
5	21	14·2	36			Moderate hirsuties, irregular menses (A)
		13·2				
6	26	19·2		1,333	1·44	Very marked hirsuties, irregular menses (A)
		18·8				
7	22	15·7		1,122	1·40	Mild hirsuties, irregular menses, family history of hirsutism
8	24	11·5	33	1,187	0·97	Moderate hirsuties, normal menses, severe headaches (A)
		11·6				
9	21	22·3		1,589	1·40	Mild hirsuties, irregular menses
10	18	14·8		1,094	1·33	Moderate hirsuties, normal menses
11	24	13·3		1,140	1·16	Mild hirsuties, scanty menses
12	22	13·9		1,650	0·84	Marked hirsuties, normal menses
13	21	18·0	80	1,565	1·15	Moderate hirsuties, irregular menses (A)
		19·0		1,411	1·35	
14	29	11·1		1,300	0·85	Mild hirsuties, irregular menses
†15	27	33·4		1,522	2·19	Mild hirsuties, irregular menses, obesity of Cushing type (A)
		28·6				
16	34	9·0		1,580	0·57	Mild hirsuties, irregular menses, obesity of Cushing type
17	18	12·1		1,150	1·05	Moderate hirsuties, irregular menses
18	25	10·5		1,327	0·79	Mild hirsuties, irregular menses, family history of hirsutism
19	20	14·8		1,394	1·06	Very marked hirsuties, normal menses
		14·7				
20		13·3		1,080	1·23	Mild hirsuties, irregular menses, obesity of Cushing type
21		16·7		1,549	1·08	Moderate hirsuties, irregular menses

(A) denotes a patient selected for adrenalectomy.
* Case published by Allen *et al.* (1939).
† Case published by Broster (1940).

a reasonable presumption that those exhibiting a greater output than 15 mg. of ketosteroid daily, and having a greater ketosteroid/creatinine ratio (i.e., 100 S/C) than 1, are cases in which there is an underlying adrenal element. Certainly the six cases of this kind which have been subjected to unilateral adrenalectomy have all shown evidence of adrenal abnormality, some in a degree that was recognizable on macroscopic examination. In others the abnormality was demonstrable by the special histological technique used by Vines. Three cases in the next lower range of excretion (i.e., between 10 and 14.9 mg.) have likewise shown histological evidence of abnormality, so that in the upper part of the normal range one cannot rule out the possibility of mild adrenal involvements where clinical signs suggestive of virilism are present. In fact, it would seem justifiable under these circumstances to suspect slight cortical hyperactivity where the ketosteroid/creatinine ratio is greater than 1. Lower still in the scale there has been only a single case in which adrenalectomy was performed. This was done on the ground that the case in question closely resembled clinically a type which had been found to benefit by the operation. The examination of the removed gland, however, revealed no abnormality, a finding which accords with the view that adrenal involvement is unlikely where the ketosteroid excretion falls below 10 mg.

The Achard-Thiers Syndrome.—A third group of virilism exists in the form known as the Achard-Thiers syndrome, a pluriglandular syndrome in which adrenal hyperfunction is one element. Patients show not only obvious signs of virilism but also well-marked diabetes and hypertension. Only one case conforming to this type has become available to us for investigation; it gave a value of 11.1 mg. for the daily ketosteroid excretion.

Other Types of Sexual Dysfunction.—While engaged in this study of adrenal cases we have from time to time encountered other cases, representing different forms of sexual dysfunction, which were of interest from the point of view of making comparisons with adrenal cases. The results are classified in Table VI.

TABLE VI.—*Other Types of Sexual Dysfunction*

(A) Feminized males; ? pituitary infantilism:
*1: 7·8, 6·4, 8·5, 6·9, 8·5, 7·1, 8·8 mg. ketosteroid daily
2: 7·0
3 (aged 14): 1·0

(B) Hypogonadism; male subjects:
1: 11·1
2: 9·6
3: 15·6

(C) Homosexuals; female subjects:
1: 15·6
2: 12·0
3: 6·7

(D) Hypopituitarism (Simmonds's disease):
1: 4·2

* Case published by Broster (1941).

The feminism group has considerable interest in that at once it is suggestive of being the clinical counterpart in males of the adrenal virilism of females. It would, however, be going beyond the evidence so far available to regard the condition as being primarily due to the influence of feminizing adrenals. A primary dyspituitarism may equally well be its basis. In all three cases the ketosteroid excretion is low, but that in itself would not distinguish between adrenal feminism and hypopituitarism.

There is nothing in the ketosteroid figures to reflect the clinically obvious hypogonadism of the cases (B) selected for investigation, nor in the next set of figures is there any definite indication of a possible ketosteroid imbalance in homosexuality.

Discussion

A general survey of the results which have been recorded shows that when the maximal obtainable values for the daily ketosteroid excretion are taken into account the various groups of subjects can be arranged in ascending order as follows: normal women, normal men, secondary virilism, primary virilism, adrenal tumour cases. When the full limits of each group variation are considered there is seen to be much overlapping among the respective groups. Certain individuals in the tumour group yield figures far in excess of those obtained in any other group, and when such findings appear they are in themselves of absolute diagnostic significance. No clear idea has yet been formulated as to the minimum level which if exceeded must definitely establish the case as one of adrenal tumour. Crooke and Callow (1939) on this point find that, in view of the results which they cite in other adrenal cases, it is impossible to consider any value up to 35 mg. daily as by itself diagnostic of adrenal tumour. As a result of our work, which embraces a class of case not separately distinguished by these authors from other types of adrenal virilism, the figure quoted above must be raised to at least 70 mg., for the primary virilism group ranges practically up to that height. It is most unlikely that our cases have covered the complete range, so that setting the demarcation line at 70 mg. does not allow of a sufficient safety margin when considering the ketosteroid assay as an absolute diagnostic test for adrenal tumour. One would probably not be erring on the side of caution in suggesting that values clearly and consistently above 100 mg. would be required in order that this significance could be attached to them. On the other hand two of the established tumour cases have had lower ketosteroid excretion than any hitherto recorded. Both patients were young children, one an infant. In both, however, the ketosteroid excretion rates relative to the normal of the corresponding age were actually higher than in many of the tumour cases, the values for which have already been published. Even so, the high relative value does not distinguish them from certain non-tumour cases in children, for it is found that those with markedly hyperfunctioning glands which give rise to primary virilism in females and isosexual precocity in males yield excretion figures quite comparable to those of tumour cases.

There is only very slight overlapping between the cases of secondary virilism and those of the other two groups just considered. However, in the lower part of the secondary virilism range are to be found many figures which come well within the normal female range. It has been established that a number of cases in which reliable clinical evidence clearly points to adrenal hyperfunction lie within normal limits. Seeing that ketosteroid determination *per se* fails in such instances to detect any abnormality, it has been suggested in an earlier section that it might have more significance when considered in relation to the creatinine output, for a proportion of cases which are not outside the normal limits of variation of ketosteroid have a higher ketosteroid/creatinine ratio than normal. Added weight is given to this suggestion by the fact that, where it has been possible to make a pathological examination of the adrenals from cases falling into this category, the findings characteristic of adrenal virilism have been observed. This ratio may thus provide an aid to the diagnosis of secondary virilism in those cases in which the ketosteroid figure lies in the upper part of the normal range.

The androgen (expressed in I.U.)/ketosteroid (expressed in mg.) ratio has varied from 1.6 to 7.4 in the cases taken as a whole. Taking the separate groups, the variations in the ratio are as follows: adrenal tumour, 3.2 and 4.7

(two cases only, and in the second the androgen was obtained by a technique that differed from the standard procedure); primary virilism, 1.6 to 2.5, mean 2.1; secondary virilism, 2.5 to 7.4, mean 4.2. The literature on this subject shows figures which cover the range 0.4 to 7.0, which is slightly wider than, but very similar to, the total range given above. In primary virilism it would appear that there is proportionally rather less biologically active material in the total ketosteroid than is encountered in the other two groups. Considering both sets of values —those for androgens and ketosteroid—in relation to their respective normal ranges, we find only one case (Case 1, Table V) in which the ketosteroid was well within normal limits while the corresponding androgens were definitely above normal. Here the ketosteroid determination failed to reveal the degree of abnormality present in the urine. Except for this, a somewhat unusual case clinically, the results of the investigation uphold the view that the ketosteroid determination alone can be relied upon to give adequate expression of the degree of abnormality in respect of cortical hyperfunction in adrenal cases of the type forming the subject of this study.

Summary

Ketosteroid output has been estimated in the following groups of cases: adrenal tumour, primary virilism, and secondary virilism.

Both primary virilism and adrenal tumour groups show very high excretion rates. At a pre-pubertal age it is impossible, solely on the basis of the ketosteroid output, to differentiate between adrenal hyperplasia and adrenal tumour.

Rather more than 50% of cases of secondary virilism give ketosteroid values that are within the normal female range. Some of these have ketosteroid/creatinine ratios that are higher than normal, for which reason this ratio is believed to have a diagnostic significance.

Three cases diagnosed as "feminism" (representing in males a near clinical counterpart of adrenal virilism in females) have shown a low ketosteroid excretion rate.

Comparative androgen and ketosteroid determinations in all groups support the view that the latter assay furnishes a reliable index of the cortical hyperfunction associated with virilism.

We are particularly indebted to Mr. L. R. Broster of Charing Cross Hospital, whose cases have constituted our main clinical material, and our warmest thanks are due to him for his close co-operation throughout. We also express our gratitude to Dr. E. C. Warner, Mr. Ian Fraser, Dr. H. W. Barber, and Dr. T. N. MacGregor for presenting us with interesting cases; to Dr. H. W. C. Vines for kindly communicating to us the results of his histological investigations; and to Dr. J. Adler for valuable assistance in compiling clinical notes.

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FLUOROSCOPIC CONTROL IN THE REDUCTION OF FRACTURES

BY

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Although fluoroscopic control in the reduction of fractures has been practised for many years the principles of protection from the risks of radiation promulgated at the second International Congress of Radiology in 1928 have not been generally accepted by the surgeons. Radiologists have always viewed the practice with misgiving and have discouraged it. In recent years, however, new impetus has been given to this type of work by the development of small, efficient, and cheap portable *x*-ray sets free from danger of electrical shock. These machines are often controlled and operated by surgeons without technical assistance and seldom under the direct supervision of a radiologist.

Some surgeons now maintain that the use of *x* rays for this purpose is of such assistance that it is essential in certain types of fracture, and actually manipulate fractures into position under the *x*-ray screen. Others use *x*-ray observation to see the result of their manipulation, while others are content with films.

It is for the radiologist to show how *x* rays may be applied to the greatest advantage without harm. His first duty is to point out the dangers involved from misuse; for *x* rays are essentially dangerous, and no warnings or precautions can render the use of them fool-proof. The surgeon who, in spite of all warnings, actually manipulates under *x* rays, exposing his hands to the direct beam, will suffer sooner or later from the cumulative effect of such exposures, even though no one of them has been sufficient to produce any noticeable change in the skin.

Recent experience in this country has prompted the Ministry of Health to issue a timely warning against the dangers of setting fractures and removing foreign bodies under the *x*-ray screen (E.M.S. Circular, 1941, Supp. **6**, Sect. III).

That the dangers involved are real is well shown in an article by Leddy and Rigos (1941) from the Mayo Clinic, quoted by Jupe (1941), on 135 cases of severe radiodermatitis among physicians. In the period 1919-34 there were 55 cases, and from 1934 to 1939 a further 80 cases. All these had injuries to the skin manifesting as severe telangiectasis, keratosis, acute or chronic ulceration, or epithelioma (39 produced cancers in themselves). Cases with early changes such as erythema, fissured nails, rough skin, slight telangiectasis or mild pigmentary changes, atrophy of the fat pads, and hangnail were excluded. Out of the 135 cases 91 sustained injury during the fluoroscopy they had employed in the reduction of fractures or the localization of foreign bodies, 6 others from taking films, and 13 admitted that they "did a little *x*-ray work." The authors found that in general the injuries were due either to a lack of proper equipment or to deficient knowledge; possibly, in some cases, they were the result of inexperience or carelessness. The use of the *x*-ray screen in the reduction of fractures was strongly condemned unless the operator carefully measured the dose he received or was under the direct supervision of an experienced radiologist, or unless he used the recommended protective devices.

All this harm is unnecessary, for with knowledge and intelligent appreciation of the dangers involved the risks may be reduced to such proportions as to be negligible and quite justifiable if fluoroscopic control leads to better surgical results.

In response to a request from the surgical staff of the Accident Service in the Radcliffe Infirmary for advice on

the protection from the risks of radiation during fluoroscopy, we have attempted to draw up certain provisional regulations acceptable to surgeon and radiologist which will ensure that dangers are minimized if not entirely eliminated

A Satisfactory Scheme

The following is an account of what, in our opinion, constitutes a satisfactory scheme:

X-ray Equipment.—Any modern ward trolley unit which is completely shock-proof is suitable for fracture service. A smaller machine or transportable unit is apt to break down if used for screening. In the design of the ward trolley unit certain features are desirable if not essential. It should be easily mobile. The tube with its protective shield should be as small as possible and mounted so that it is adaptable for use in any position, with automatic locking devices for positions in the vertical and horizontal planes. The arm carrying the tube should rotate on the vertical supporting column so that the tube can be swung into position when required or removed for the surgeons' convenience. A standard fixed screening couch is unsuitable for our purpose because the surgeons wish to employ their own tables and appliances in the operating theatre or the plaster room. Although we admit that a screening couch incorporating mechanically coupled tube and screen with fixed shields for protection is safe provided it is used properly, we contend that this unit is essentially suited to the requirements of the radiologist rather than of the surgeon. Many couches are so constructed that they actually hinder the surgeon's movements and are not adaptable for screening in any position.

Operation of the Unit.—A trained technical assistant is directed to operate the machine under conditions of 3 mA, 50 to 60 kV, and 1 mm. of aluminium filtration at never less than 20 inches focus-screen distance.

Fluoroscopy.—In most instances we employ the Miller indirect fluoroscope incorporating a 7 in. by 5 in. fluorescent screen. The screen is activated by a beam directed downwards from an overhead tube, the beam being controlled to cover a circle not greater than 5 inches in diameter at 30 inches distance, a convenient-sized field. With tube and screen set up in this manner it is possible to view most fractures of the elbow, forearm, wrist, or hand in two planes by turning the limb. In cases in which the limb cannot be turned it is suitable for only one view, and a second must be made from the side. For this purpose the tube is directed so that the *x*-ray beam passes through the limb towards the surgeon, the spread of the beam being limited to a circle of 5 inches in diameter at 30 inches focus-screen distance. The screen is mounted behind lead glass of 1 mm. lead equivalent and fitted with handles covered by attached metal shields to protect the hands. Observations are made with a 15 in. by 12 in. fluorescent screen held in place by an assistant so that the circle of illumination appears in the centre of the screen. A similar procedure is adopted, using an under-couch tube, when it is impossible to screen from above at a satisfactory focus-screen distance.

We believe that the field of illumination should be the same for every case, for if different cones or a variable diaphragm are used to give fields of different sizes it is impossible for the operator to be familiar with the limits of safety imposed by any one of them. The conditions are not comparable to those of the radiologist screening a barium meal, in which it is customary to confine the beam to the part being examined, so that none of the direct rays pass to the screen without traversing the patient's tissues. Admittedly there are definite advantages to be claimed for this technique, using a variable diaphragm, but the radiologist is well protected, whereas the surgeon desires to dispense with any shield or apron which might in any way obstruct his movements. In these circumstances the surgeon must work with the *x*-ray machine under constant conditions of operation.

If a suitable cone is not available a diaphragm may be cut from a sheet of lead. It can be mounted on plywood and fixed to the tube or incorporated in a larger cone by means of strapping. We prefer a circular cone or diaphragm because, when the current is on, the surgeon is at once aware that the tube is properly centred.

Protection

The quantity of radiation which can be tolerated over a long period without ill effects is 0.2 *r* daily, which is known as the daily tolerance dose. Although this dose may be exceeded without apparent harm, it is unwise, for the cumulative effects of many repeated doses are apt to be more dangerous than one single over-exposure. If tissue changes do occur they will probably persist and prove intractable to treatment.

Under conditions of 3 mA, 60 kV, and 1 mm. of aluminium filtration, with the beam controlled by a cone to give a circular field 5 inches in diameter at 30 inches focus-screen distance, we measured 0.2 *r* in the direct beam in 2.3 seconds at 20 inches or 5.04 seconds at 30 inches, according to measurements for 5 *r* with the dosimeter. There was very little scattered radiation, for dental films exposed for 5 minutes at 10, 20, and 30 inches from the centre of the beam at the level of the tube head and at the level of the fluorescent screen showed no perceptible blackening when compared with other films given measured exposures and developed under standard conditions. After 10 minutes there was a faint exposure on the film placed 10 inches away from the centre of the beam at the level of the fluorescent screen, corresponding to a blackening value slightly less than 0.2 *r*.

In view of the figures obtained from these experiments we believe that the surgeon must in no circumstances expose his hands or any part of himself to the direct beam, which means that it is impossible to operate with safety under the screen. The surgeon must first manipulate without screen guidance and then view the result. On the other hand, protection from scattered radiation seems adequate provided that the total time of screening is limited, which is a great advantage, for a lead apron imposes restrictions on movement and cannot be worn during an open operation, so that very few surgeons will ever wear one. However, it is unwise to dispense with such protection without periodic tests under actual conditions of operation, for, unless the tube head is properly screened and the proper-sized cone or diaphragm is in place, leaving no clear space between the tube outlet and the cone, there may be some risk. If a dental film is worn on the surgeon's gown during operation it should show no appreciable blackening when developed and compared with standard exposures.

We have repeatedly made satisfactory tests, using the Miller fluoroscopic box and with the tube set up for viewing from the side with a 15 in. by 12 in. fluorescent screen. There has been no occasion to use the under-couch tube for clinical practice, but trial tests seemed satisfactory.

Factors in the Practice of Fluoroscopy

It is quite clear that the practice of fluoroscopy must be limited, for under the conditions described the daily tolerance dose from scattered radiation may be reached in approximately 10 minutes if the surgeon stands close enough to the beam. Accordingly, the decision to employ fluoroscopic control in the reduction of a fracture is made only by an experienced surgeon who is responsible for the instruction of junior officers under direct supervision. On each case he spends as little time as possible. He manipulates with the current off and then views the result in a dim light.

Proper lighting is one of the most important factors influencing the total time of screening, for to make a quick decision the surgeon must be able to see as clearly as possible. We find that daylight screening is impracticable. Whenever circumstances permit, the operation is conducted in dimmed artificial light, with the lights so arranged that none of them shines direct into the surgeon's eyes or into the mirror of the indirect fluoroscope. It

should be possible to put out all the lights by a master switch hanging from the ceiling, which may be operated by the radiographer as he stands at the *x*-ray machine. If the surgeon cannot see clearly he must wait until his accommodation improves, and on no account ask the technical assistant to make the screen brighter. He must realize that even under the best conditions there are very definite limitations to the use of the screen. It is possible to view most of the bones of the extremities in antero-posterior and lateral projections, but in some instances, with fractures in the vicinity of the shoulder-joint or hip-joint in heavy subjects, fluoroscopy is useless.

Under suitable conditions we have determined that a single exposure of 12 seconds, the usual limit of the time clock, is sufficient to show alignment. The total time of screening for each case has been fixed at one minute, thus allowing five attempts to be made to achieve reduction. In the event of a house-surgeon failing to complete reduction the case is referred to the surgeon in charge. No one is allowed to screen for more than 5 minutes daily.

The radiographer in attendance at the operation is instructed never to permit free use of the tube, but to set the time clock for relays of 12 seconds' exposure, allowing an interval of 2 minutes between each, and never exceeding a total screening time of one minute without warning the surgeon. The total screening time for each case is recorded in a book, which the surgeon is asked to sign. Subsequently the entries are checked by the radiologist.

Before applying plaster to the limb the position of the fragments is checked by clinical inspection of the whole limb in a good light, and the findings are verified by radiography. Satisfactory films should show true antero-posterior and lateral projections of the joint above the fracture, the fracture site, and the joint below. Only in this way is it possible to judge the alignment of the distal joint surfaces on those above. In some instances in which there is pre-existing deformity it may be necessary to make a comparison with the opposite side. These precautions are essential, for it is very easy to miss considerable deformities by radiographic methods alone, especially when the limb is encased in plaster.

During radiography the surgeon must on no account hold a cassette in place or stand in the path of the *x*-ray beam, for a single exposure exceeds the tolerance dose of 0.2 *r*. As a measure of general health, all members of the surgical staff engaged in the accident service are advised to have blood counts at three-monthly intervals.

These views have been summarized in the form of provisional regulations on the screening of fractures. A printed copy is hanging in the surgeon's room, where it may be seen by new-comers. Another copy has been issued to all radiographers.

Our experience to date shows that the scheme is working very well, although there remain details to be worked out. The records in the radiographers' book may ultimately yield useful information as well as provide a check on the amount of work done. Already they have shown that in 3 out of 5 cases in the hands of the senior surgeon the total screening time was under 6 seconds in each case, reduction being subsequently verified by films, whereas the junior surgeons screen for much longer periods. No one has screened for more than one minute.

Conclusions

In proper hands the viewing of fractures with the *x*-ray screen to observe alignment after manipulation is a safe procedure, providing that it is carried out under well-defined conditions over which there is adequate control. On no account must fractures be actually manipulated under the screen.

An account is given of the provisional regulations which have been accepted by the surgical staff of the Radcliffe Infirmary. It is hoped that others will be tempted to put forward their views and that ultimately general recommendations will be framed to help the surgeon. Later it may be possible to develop apparatus which will enable the work to be carried out under ideal conditions for the protection of the operator.

I wish to acknowledge the help of Mr. J. C. Scott, surgeon in charge of the accident service, and his assistants; and to thank Messrs. Philips Metalix for full details about the Miller fluoroscope. Eastman dental films were used to make the physical measurements. I am indebted to Dr. J. F. Brailsford for his encouragement to proceed with this paper, to Dr. G. Spiegler for his criticism of the physical experiments, and to Dr. A. E. Barclay and Dr. H. Courtney Gage for personal communications about their own experiences.

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A SIMPLE METHOD OF REDUCING MID-SHAFT FRACTURES OF THE HUMERUS

BY

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Major, R.A.M.C.

Generally speaking, fractures of the middle third of the humerus present little difficulty in securing accurate reduction. There are, however, cases which defeat the efforts of the most experienced manipulator. Considering the close relation of the musculo-spiral nerve to this part of the humerus, it is conceivable that over-energetic attempts at reduction could account for some of the cases showing damage to this nerve. There is a tendency to accept a reduction with varying degrees of displacement providing alignment is good. This is often seen in the simple transverse fracture showing backward and upward displacement of the lower fragment. A simple method of reducing fractures of the shaft of the humerus is here described whereby the likelihood of these complications arising is minimized. Two illustrative cases are recorded.

Details of Method

The patient is seated on an adjustable stool (theatre type), facing the head end of the operating table, with hand in pronation resting on the edge (Fig. 1). An ordinary adjustable stand, the type generally used for holding a gravity reservoir, is placed behind and on the injured side, with the hook of the movable rod over the point of the shoulder. Strong 2-inch webbing fitted with a buckle is passed under the axilla and hung on the hook of the stand. Protective felt is placed in the axilla to prevent pressure. The movable rod is now adjusted until the shoulder girdle is well supported. By moving the operating table backwards or forwards the arm is brought to the perpendicular, and by moving the table up or down the forearm is brought at right angles to the upper arm. Strong cord, threaded through protective felt, is placed round the forearm close to the elbow-joint, and 15 to 20 lb. is fixed to it. The position of the limb is then rechecked, and the weight is allowed to exert traction for from twenty to thirty minutes. No anaesthetic is necessary, as the patient stands the

procedure without undue discomfort. In exceptional cases, requiring manipulation at the point of fracture, a brachial block is used.

X-ray control of reduction is desirable if available, but it has been found that reduction is usually complete after

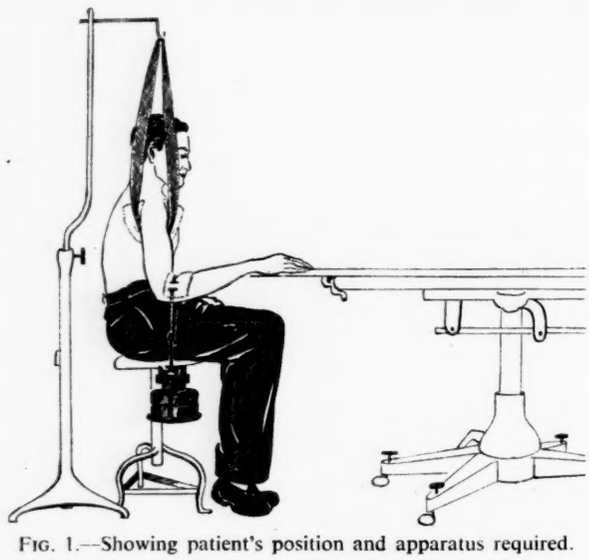

FIG. 1.—Showing patient's position and apparatus required.

twenty minutes, and in the cases recorded check radiographs were deferred until the following day. It may be noted that the whole procedure can be carried out in the *x*-ray room without upsetting the routine of that department.

With the weights still in position some form of immobilization is applied. As a primary method the plaster slab is the most satisfactory, because, if necessary, this can be continued to an abduction shoulder spica or the limb be further immobilized on any of the many abduction frames. Fig. 2 shows the method of applying the slab. Some descriptions of this procedure advise retaining the slab in position by a cloth bandage. In the method here described it has been found more satisfactory if a few turns of plaster bandage are carried well up into the axilla. These turns can be applied more tightly than is usual without any great danger.

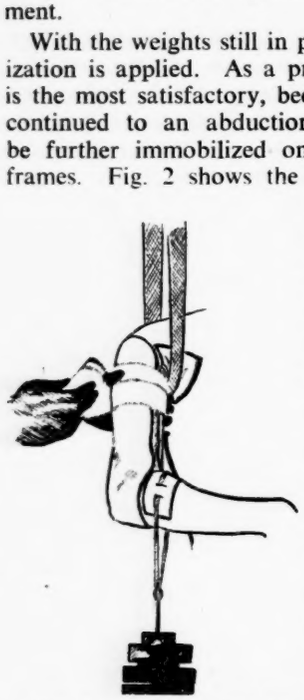

FIG. 2.—Immobilization by plaster slab. Note the circular turns of plaster bandage carried well up into the axilla.

When the plaster has become firm the weights are removed and the limb is bandaged to the trunk, with the forearm supported by a sling. With the limb in this position a small range of elevation movement is possible at the shoulder-joint. There is also a limited range of flexion at the elbow, according to the height at which the sling is tied. These restricted movements, along with active movements of the wrist and fingers, are begun early.

Post-reduction radiographs are taken as soon as is convenient, and if reduction is not satisfactory the weights can be reapplied without removing the plaster casing. So far I have found that once reduction is complete there is little tendency to redisplacement.

Illustrative Cases

Case 1.—A lance-corporal was admitted with a history of injury to the right arm sustained by a fall while engaged in physical training. Clinically he showed a gross angulation deformity of the mid-shaft of the right humerus, with shortening of one and a half inches. Dorsiflexion of the wrist was not possible. One attempt at reduction had been made before admission. Treatment was carried out by the method described. At eight weeks clinical union was sound, with steady improvement of the injury to the musculo-spiral nerve.

Case 2.—A soldier was admitted giving a history of injury to the left arm sustained in a motor-cycle accident. Clinically he showed a fracture of the mid-shaft of the left humerus, with the lower end of the upper fragment palpable anteriorly and with 3/4 inch shortening. There was no evidence of musculo-spiral involvement. One attempt at reduction was made before admission and one in hospital by a colleague. Treatment was carried out by the method described, except that a brachial block was used. At seven weeks clinical union was sound, and a radiograph showed good callus formation.

Summary

A simple method for reducing fractures of the mid-shaft of the humerus is described. It is designed to secure accurate apposition of fragments, with minimum trauma to soft tissues. General anaesthesia is not necessary, and only in exceptional cases is a brachial block required. A minimum of apparatus is needed, that suggested being standard equipment of any hospital.

SNEEZING, AND DISINFECTION BY HYPOCHLORITES

BY

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While the photographic technique developed in America (Jennison, 1941) and recently used in this country (Bourdillon and Lidwell, 1941) has shown that many thousands of droplets are emitted during a vigorous sneeze, few quantitative studies of aerial infection from sneezes have been recorded. Winslow and Robinson in 1910 published a useful review of earlier work and described some quantitative tests of their own on the spray emitted in speaking and coughing, but the only quantitative data we have seen on sneezes are the observations of W. F. and M. W. Wells (1936), made with their air centrifuge. They showed that 50 sneezes from a group of subjects in an air-conditioned room sent up the count of "α streptococci" from 0 to 220 per cubic foot. The following notes describe a brief quantitative study of the number of bacteria-carrying particles given out during sneezing, of their rate of disappearance from the air in a closed room, and of the rate at which they are killed by a hand spray, using sodium hypochlorite.

Technique

A small room of 816 c.ft. capacity (11 ft. 6 in. by 7 ft. 6 in. by 9 ft. 3 in. high) contained a table, two wooden chairs, and heating-pipes. The floor and table were oiled to keep down dust, the door and window were kept shut so far as was possible, and the air in the room was circulated, partly by convection from the hot-water pipes, but chiefly by a 12-inch electric "table" fan pointing upwards at 45 degrees from one corner of the floor and running at about half-speed. The air was sampled through two glass tubes (diameter 1 inch) leading from points about 1 ft. 6 in. above the table through one of the walls

to a corridor. One tube led to a slit sampler for air-borne bacteria, of the type described recently (Bourdillon, Lidwell, and Thomas, 1941). In this instrument the air is sucked at a rate of 1 c.ft. per minute through a narrow slit on to the surface of nutrient agar (containing 10% of horse serum in these tests) in a slowly rotating Petri dish. The Petri dish is then withdrawn, and is incubated for eighteen to twenty hours at 37° C. before counting the colonies. Incubation was usually aerobic, but in a few tests anaerobic jars were used. The other glass tube led to a sampler for estimating the hypochlorite dispersed in the air, whether as gas or as solid particles. This sampler consisted of a glass absorption apparatus in which the gas was brought into intimate contact with a 0.1% solution of *o*-toluidine in normal aqueous hydrochloric acid. After sucking 1/2 or 1 c.ft. through the liquid the yellow colour produced was estimated photo-electrically. In some experiments Petri plates of 9 inches diameter containing serum agar were also exposed on the table at a distance of five feet from the man who sneezed.

Course of an Experiment

After leaving the room shut overnight to let dust settle, the sneezer and one experimenter entered the room and sat down with as little brisk movement as possible. With these precautions the number of bacteria-carrying particles found during the initial control period of each experiment was too small to influence the results appreciably. It was usually 2 or 3 per c.ft., but once was as high as 6. A control period of five minutes ensued, during which bacterial sampling of the air of the room was done from outside with the slit sampler, and sometimes also with Petri plates placed on the table. One experimenter then took snuff or the bromine compound mentioned in a previous paper (Bourdillon and Lidwell, 1941) and sneezed from two to five times in the course of one or two minutes. The fan was kept running from shortly before the sneezes until varying periods after them (one minute after in Curve A in the Chart, for the whole experiment in Curve C, and until after the hypochlorite spraying in the spray tests). One minute after the last sneeze samples of air were again taken, and sampling was continued at frequent intervals up to forty-five minutes from the sneeze. In tests in which hypochlorite was sprayed, sampling was continued as in the other tests, but spraying was also carried out between one and three minutes after the sneeze. An experimenter walked round the room with a hand spray spraying a 1% solution of sodium hypochlorite in water. In the later tests, including those recorded here, the hand spray used was of an improved type, baffled so as to deliver a fairly dry mist containing 8 to 9 c.cm. of the hypochlorite solution for each 100 strokes of the pump. We understand that the Ministry of Health proposes to issue sprays of this type for use in London shelters.

A. Control Tests without Hypochlorite

Table I shows the colony counts obtained in one of the control tests. In this test the subject sneezed four times in quick succession.

TABLE I

Counts from Slit Sampler		Counts on 9-inch Petri Dish	
Time	Count per c.ft.	Time	Count per min. exposed
Shortly before sneezes	2	6 to 1 min. before sneezes	0·2
,, ,, ,,	2		
1 min. after sneezes	492	1 ,, 2 min. after sneezes	220
3 ,, ,, ,,	440	2 ,, 3 ,, ,, ,,	215
5 ,, ,, ,,	342	5 ,, 6 ,, ,, ,,	153
8 ,, ,, ,,	288	10 ,, 15 ,, ,, ,,	82
10 ,, ,, ,,	196	15 ,, 20 ,, ,, ,,	45
15 ,, ,, ,,	157	20 ,, 25 ,, ,, ,,	35
20 ,, ,, ,,	89	30 ,, 35 ,, ,, ,,	14
25 ,, ,, ,,	51	45 ,, 50 ,, ,, ,,	3
30 ,, ,, ,,	30		
40 to 45 min. after sneezes	10		
45 ,, 50 ,, ,, ,,	8		

Five other tests were made similarly without hypochlorite spray, giving similar results, except that they average slightly lower initial counts and a slightly greater rate of fall.

Total Number of Infective Particles

On multiplying the number of colonies obtained from one cubic foot of air by the number of cubic feet (812) in the room, we find that the total number of bacteria-carrying droplets emitted in each sneeze of this experiment averaged not less than 490 × 816 ÷ 4 = 99,960. As this includes none of the larger droplets which fell below the level of the sneezer's head (3 ft. 6 in.) during the first minute after the sneeze, the true figures for total infected particles per sneeze must be considerably higher. The calculation assumes uniform mixing throughout the room within the first minute after the last sneeze. Evidence that such mixing was sensibly achieved (by the fan) is given by the uniform slope of the curves showing the fall in bacterial content after the second minute.

Curve A in the Chart shows the counts given by the slit sampler in this experiment. It is interesting to note that the points as plotted on a logarithmic scale lie on a straight line. This is what would be expected from particles of uniform small size, with a rate of fall slower than the velocity of the convection currents in the room concerned.

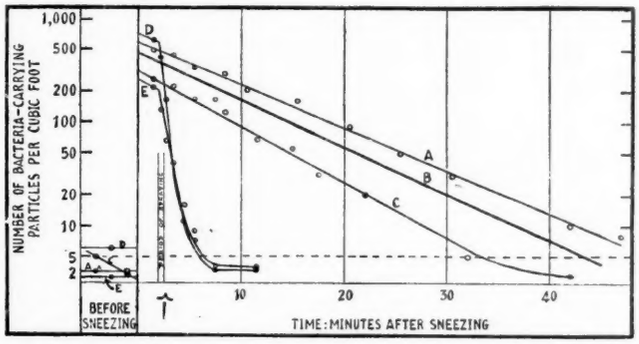

Chart showing numbers of bacteria-carrying particles before and after sneezing: Curves A, B, and C without spraying (Curve B gives the mean values for six such tests) ; Curves D and E with hypochlorite spray. The numbers greater than 5 per c.ft. are plotted logarithmically, but in order to save space the numbers below 5 (under the dotted line) are plotted arithmetically. *The vertical arrow points to the period of spraying.*

Duration of Suspension of Particles

The numbers of particles remaining suspended as long as forty minutes after the sneezes are higher than most people would expect. Thus the figure of 10 per c.ft. at forty-two minutes shows that there were still 8,000 bacteria-carrying particles in the room. Line B in the Chart gives the average values for the six control tests without hypochlorite. This line shows that half an hour after the sneezes there were on the average 20 bacteria-carrying particles per c.ft.—i.e., over 16,000 in the room. It thus seems probable that the danger of infection from a sneeze may last at least half an hour in a closed room.

Equivalent Ventilation Rates

When discussing impurities in the air it is useful to adopt the practice, employed by ventilation engineers, of expressing the rate of removal of the impurities in terms of the amount of pure air which would have to be introduced in order to remove the impurities at the rate observed. The amount of pure air needed for this is usually stated in "turnovers per hour"—i.e., in the number of times per hour that a volume of fresh air equal to the volume of the room is introduced. Expressed in these terms, the rate of removal of the sneeze droplets in our tests was equivalent on the average to 6.4 turnovers per hour, and ranged from 5 to 9 in the different control

tests. Such a variation in the rate of fall is to be expected as the result of the varying size of droplets, caused by different rates of expiration and different degrees of closure of the lips and teeth in the various sneezes. Curve C is that of a sneeze having a rather higher rate of fall, equivalent to 7.8 turnovers per hour.

B. Tests with Hypochlorite Spray

Table II shows the results recorded by the slit sampler in two tests in which a hand spray of hypochlorite was used. In each test the subject sneezed four times. Only the slit sampler results are given in this case.

TABLE II

Time	Experiment I Count per c.ft.	Experiment II Count per c.ft.
Shortly before sneezes ..	5	6
" " " ..	1	
1 to 2 mins. after sneezes ..	213 (20 strokes of spray pump given at 2 to 2½ mins. after sneezes)	616 (30 strokes of pump at 2 to 2½ mins.)
2 to 2½ " " " ..	128	424
2½ to 3 " " " ..	64	168
3 to 4 " " " ..	40	38
4 " 5 " " " ..	16	11
5 " 6 " " " ..	7	9
7 " 12 " " " ..	2·5	3
Rel. humidity, 66% ; dry-bulb temp., 65° F. Max. apparent concentration of HClO observed just after spraying : 1 vol. per 7 million vols. air (0·00035 mg. per litre). Ventilation turnover giving equal rate of disappearance of particles, 67 per hr.		R.h., 75% ; dry-bulb, 65° F. Max. apparent HClO : 1 vol. in 10 millions (0·00024 mg. per litre). V.t. = 130 per hr.

These results are also shown in the Chart as Curves D and E. In each case the kill is very rapid. The faster rate of kill in Experiment II may possibly be related to the higher humidity.

We made fifteen tests in all, giving similar rapid kills of sneeze particles. It is interesting to calculate the number of bacteria-carrying particles which would be inhaled by persons who remained in a room after a series of four sneezes under the conditions shown in the Chart. Assuming a respiratory volume of 1/3 c.ft. per min. (=9.52 litres/min.) integration shows that in the case of the average unsprayed sneezes represented by Curve B about 1,200 bacteria-carrying particles would be inhaled during the thirty or forty minutes following the sneezes. In the instances in which hypochlorite was sprayed, only about 80 particles would be inhaled—i.e., about 1/15 of the number when no spray was used. Calculation shows that if after an event such as a sneeze the particles in the air are removed by any process, in one instance at a rate equivalent to a ventilation turnover of x per hour and in another instance at a rate of y turnovers per hour, then the total particles inhaled in the two cases will be in the ratio y/x. In the cases just quoted the equivalent turnover averages 98 for the hypochlorite action and 6.4 for the die-away of the control sneezes without spray. This ratio 6.4/98 is close to the 1/15 calculated above.

Limitations of Hypochlorite Sprays

While in the above-quoted fifteen instances the sneeze particles have been quickly killed by the hypochlorite, it must be remembered that this process is subject to serious limitations by various factors which are not yet wholly understood. The following restrictions have come to our notice as yet:

1. Many of the dry organisms found in dust are not quickly killed by the hypochlorite in the concentrations used. In our tests the spray has appeared to kill all the oral and nasal organisms, and some, but not all, of the dust organisms present before the sneezes.

2. As shown by Baker and Twort (1941) hypochlorite sprays become ineffective, or much less effective, when the air is very dry. We are not sure of the practical lower limit of humidity for effective killing. It is certainly below 60% at 70° F.

3. The rate of die-away of hypochlorite sprays is usually rapid, especially in crowded places.

4. Hypochlorous acid gas reacts rapidly with the vapour of most volatile organic compounds, especially phenols and cresols. Hence it is important to avoid the vaporization or spraying of these substances in any closed space in which disinfection by hypochlorite sprays is proposed. We have on two occasions failed to secure a sufficient concentration of hypochlorite owing to the use of cresol vapour in the room some days previously.

Discussion

The danger of infection from oral or nasal spray droplets is a matter of varying opinions. Thus Winslow and Robinson (1910) describe the "mouth spray" as "a fairly coarse rain which quickly settles downward," and conclude that "aerial infection of any sort is a minor factor in the spread of zymotic disease." Gordon (1906), on the other hand, after extensive studies, considers infection by oral droplets of great importance. Complete proof of their importance is unlikely until methods for the isolation and estimation of the viruses have advanced much beyond their present stage of development. But even now strong evidence of the importance of droplet infection is given by the facts that diseases of the upper respiratory tract are highly infectious and that these infections are transmitted by air-borne organisms. Our own tests quoted above give similar rates of fall of particles to those observed by Koeniger (1900) and quoted by Winslow and Robinson. But it seems hardly justifiable to describe as "a fairly coarse rain" particles of which 20% remain suspended for fifteen minutes and [illegible]% for thirty minutes. We would rather emphasize the large number of infective particles which are emitted in sneezing, and the surprisingly long time before the number suspended becomes negligible.

Summary

Tests in a closed room have shown that an average vigorous sneeze causes the emission of about 100,000 bacteria-carrying particles of a size small enough to remain in the air for more than one minute. Of these about 4% will usually remain suspended in still air for as long as thirty minutes.

All or almost all the bacteria thus emitted can be killed in three to four minutes by a spray of 1% sodium hypochlorite solution in a concentration of 2.1 c.cm. per 1,000 c.ft. of air.

Certain unfavourable conditions exist, such as low relative humidity or high content of organic matter in the air, which may hinder the action of hypochlorite sprays.

We are indebted to Dr. C. H. Andrewes for encouragement and advice in this research.

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The committee for the Strickland Goodall Memorial Lecture in Cardiology consists of the Master of the Society of Apothecaries, Sir Stanley Woodwark ; Sir Hugh Lett, Bt. ; Sir Thomas Lewis, nominated by the President of the Royal Society ; the President of the Royal College of Physicians, Sir Charles Wilson ; and Dr. Geoffrey Bourne, nominated by the President of the Royal Society of Medicine. It has appointed Dr. William Evans, physician in charge of the cardiac department of the London Hospital, to deliver the third lecture, in June, 1942. The subject chosen is "Triple Rhythm," and the lecture will be given at Apothecaries' Hall, Blackfriars Lane, Queen Victoria Street, E.C.4.

Reviews

CLINICAL BIOCHEMISTRY

Office Clinical Chemistry. A Laboratory Guide for the Practitioner and Hospital. By Emanuel M. Abrahamson, M.A., Ph.D., M.D. (Pp. 245. 25s. net.) London, New York, and Toronto: Oxford University Press. 1941.

This book's title, which would present no difficulty to American eyes, seems to us a little incongruous. Its meaning only becomes clear when we look to the preface for a statement of the general aim of the work. Briefly it is to present a simplified version of clinical biochemistry which might bring the more fundamental of its methods within the scope of clinicians equipped with only such limited laboratory facilities as might be furnished in the consulting-room, surgery, or ward side-room. Theoretically it is a laudable object thus to attempt to extend the availability of clinically useful methods, but in practice it has its obvious drawbacks, and it would be prudent for those not well trained chemically at least to consult an expert biochemist before relying upon results obtained, no matter how good the textbook instructions.

Let it be said at once that the directions in this volume are excellent, being accurately and clearly laid down in the most straightforward manner. Not only so, but visualization of the processes is facilitated by the device of using "flow-sheets," with arrows as sign-posts to the various steps. The methods are selected so as to require a minimum of reagents and standard solutions, and pieces of simple apparatus are described which may readily be improvised. It is most surprising, however, in such a book not to find the hypobromite method given for urinary urea, while in the opposite direction the inclusion of the working of a photo-electric colorimeter is equally astonishing. But whatever debatable points it may raise, this book should prove most helpful to those working in small laboratories with minimal equipment.

THE LAW AND MEDICAL PRACTICE

Law for the Medical Practitioner. By D. Harcourt Kitchin. The Practitioner Handbooks. Edited by Sir Humphry Rolleston, Bt., M.D., F.R.C.P., and A. A. Moncrieff, M.D., F.R.C.P. (Pp. 376. 15s.) London: Published on behalf of the *Practitioner* by Eyre and Spottiswoode (Publishers) Ltd. 1941.

There is some reason to suppose that the overloading of the curriculum for medical qualification, due to constant advances in so many branches of medical science, has led to a certain shelving both of medical jurisprudence proper and of the study of legal problems in medical practice in the education of the medical student. Though this may not be of really serious moment in respect of medical jurisprudence (because in any case resort to a textbook is a necessity whenever the practitioner is confronted with a problem in this specialty), it is very much to be deplored that young men should start practice ignorant about certification of the insane, of the deceased, and of the sick or injured; about medical evidence before coroners' and other courts; about libel, divorce, negligence, abortion, medical defence societies, and scores of other elements in ordinary practice which bring them in contact with legal processes. It is this deficiency in our professional armament which Mr. D. Harcourt Kitchin fills in with his *Law for the Medical Practitioner*—a book designed not so much for examination purposes as for the guidance of those in practice, especially general practice, though specialists and those holding public (medical) appointments of any kind will also find that the book very well repays careful study. All who absorb its teaching will have received a very thorough immunization against the legal difficulties which are liable to confront doctors at the most unexpected moments. There are just one or two tiny slips on medical matters to show that the author is not infallible; but the book as a whole is so excellent that it would be ungracious to dwell upon them.

Mr. Kitchin is never afraid to expose injustices and inconsistencies in the law as it exists or has been interpreted: over and over again he propounds for his own profession the amendment of this or that provision of the law which causes hardship to individuals or damage to the interest of the State, so that it is not merely ourselves but judges and Government Departments—particularly the Home Office—who might well profit by reading his pages. The law is sometimes accused of preferring a sterile kind of logic to plain common sense; but this is not always the case, as is shown, for instance, when Mr. Kitchin explains that the children of a voided marriage—that is, of a marriage which has been pronounced never to have existed legally at all—may in the eyes of the law be legitimate issue of their parents. But if a start were made on the curious and interesting facts which this textbook expounds it would be difficult to make a finish: let it suffice that the book is admirably constructed, admirably concise, admirably written, and that the publishers have produced it in a manner worthy of the excellent material they had to deal with—type, sub-editing, proof-reading are first-rate (though on page 259 the author is made to say "curable" when he means "incurable").

FIRST LINES IN MIDWIFERY

A Handbook of Midwifery for Pupil-Midwives, Midwives, and Obstetric Dressers. By Sir Comyns Berkeley, M.D., F.R.C.P., F.R.C.S., F.R.C.O.G. Eleventh edition. (Pp. 622. 8s. 6d. net.) Cassell and Co. 1941.

The fact that this is the eleventh edition of Sir Comyns Berkeley's comfortable and competent *Handbook of Midwifery* is evidence both of its usefulness and of the detailed care with which it is constantly revised. In the preface Sir Comyns explains that he has accepted some suggestions by reviewers, but not that of adding a section on the relation of the midwife to the public health services, as Arnold and Co. publish a suitable textbook on that subject. The simpler references to medical treatment which should interest obstetric dressers and midwife lecturers have been retained, but information which an advanced medical student could find elsewhere has been cut out.

The chapter on food added in the appendix will be of practical value, though one fears that some of it—for example, the paragraphs on the amino-acids—will prove difficult reading for a pupil midwife, and there is no indication of its relative unimportance to her. On page 589 the vitamins have got their alphabet a little out of order, as in No. 8. The latest arrival—K—has been given its place among its fellows, but is not referred to in the section "Haemorrhagic Disease of the Child," which is rather oddly indexed under "Uterine in Child." The index has been very successfully redesigned with main references in heavier print—a boon to a student seeking information on a special point. The coloured plate of pemphigus neonatorum is a feature of this edition. Is it really true that in the left lateral position (the hip-joints being invariably flexed) the coccyx is tilted backwards? Surely the only advantage of the lateral position is the supposedly less exposure. As the original squatting position for delivery can seldom be tolerated the dorsal position with well-flexed legs should be the next best, as one sees in the East and in many American hospitals.

It will be obvious that the reviewer has had to hunt for items upon which to remark. The sturdy little book is in point of fact a pure and attractive fountain of knowledge, very much to be appreciated.

BRITISH MEDICAL JOURNAL
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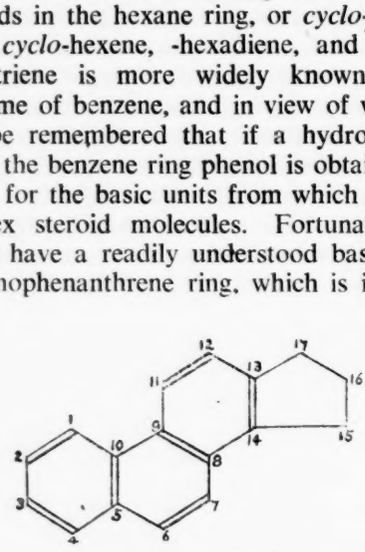
SATURDAY JANUARY 10 1942

CHEMISTRY OF THE OESTROGENS

The chemistry of the steroid hormones looks and sounds too complicated for the medical man, but as the years go by and these substances are more and more widely used some idea of the chemical nature and relations of the various compounds now available should be useful. Recently the steps leading to the isolation or discovery of the natural and synthetic oestrogens, and the proof of their formulae, have been reviewed by Doisy[1] and by Dodds[2] respectively. Memories of the organic chemistry learnt in pre-clinical years are generally hazy, but most of us can recall the straight chain (aliphatic) hydrocarbons—methane, ethane, etc.—and probably it does not tax us too much to recall that the sixth member of this group (hexane, C_6H_{14}) can be converted into a hexagonal ring structure or aromatic compound, and that in saturated hydrocarbons all the available valencies, apart from those joining the neighbouring carbon atoms in the chain, are taken up by hydrogen atoms. If two hydrogen atoms are removed from neighbouring carbon atoms these two carbons are now linked by a double bond and the molecule is said to be unsaturated. An unsaturated compound is referred to by the suffix *-ene*, so that according to the number of double bonds in the hexane ring, or *cyclo*-hexane, one may have *cyclo*-hexene, -hexadiene, and -hexatriene. *Cyclo*-hexatriene is more widely known under the familiar name of benzene, and in view of what follows it should be remembered that if a hydroxy group is attached to the benzene ring phenol is obtained.

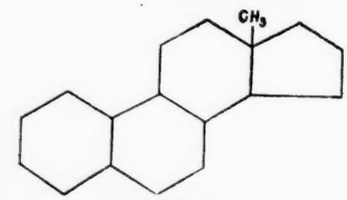
So much for the basic units from which are built up the complex steroid molecules. Fortunately all the sterols also have a readily understood basic unit—the *cyclo*-pentenophenanthrene ring, which is illustrated in Formula I.



I. *Cyclo*-pentenophenanthrene

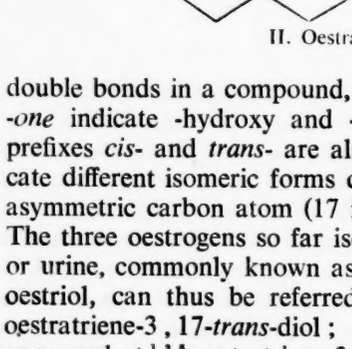
It has a four-ringed (tetra-cyclic) structure consisting of three benzene rings (phenanthrene) with one *cyclo*-pentane ring attached; as, however, this latter ring is attached to its benzene ring along a double bond it becomes a *cyclo*-pentene ring. The numbers of the more important carbon atoms are also indicated. This is the basic structure for the hormones of the testis and adrenals as well as for those of the ovary—the difference between these three (or, including progesterone, four) groups of hormones lies in the degree of saturation and in the attached methyl groups.

Oestrane (II), which is the name given to the parent compound of the natural oestrogens, is a completely saturated form of *cyclo*-pentenophenanthrene with a methyl group attached to the carbon atom numbered 13. While it is not essential that the actual chemical nomenclature should be known, it may be interesting to work out the structure from the chemical name, so the following rules may be found useful. Δ with a number or numbers with it indicates the actual position of the

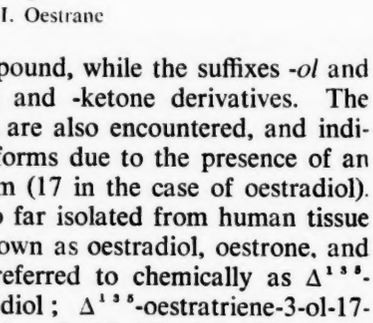


II. Oestrane

double bonds in a compound, while the suffixes *-ol* and *-one* indicate -hydroxy and -ketone derivatives. The prefixes *cis-* and *trans-* are also encountered, and indicate different isomeric forms due to the presence of an asymmetric carbon atom (17 in the case of oestradiol). The three oestrogens so far isolated from human tissue or urine, commonly known as oestradiol, oestrone, and oestriol, can thus be referred to chemically as $\Delta^{1,3,5}$-oestratriene-3, 17-*trans*-diol; $\Delta^{1,3,5}$-oestratriene-3-ol-17-one; and $\Delta^{1,3,5}$-oestratriene-3, 16, 17-triol. The structural formulae of oestradiol (III) and oestrone (IV) are illustrated, and comparison with the chemical names should make the principles of the nomenclature clear.



III. Oestradiol



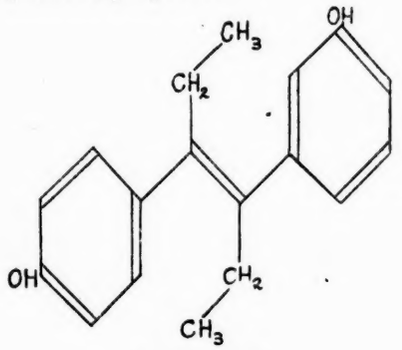
IV. Oestrone

All these three oestrogens have been isolated from human urine in pregnancy and from placenta, but only oestrone and oestradiol have so far been obtained from ovarian tissue. The difficulties in such extractions are emphasized by the fact that only about 6 mg. of each substance were obtained from one ton of sows' ovary. Other oestrogens obtained from animal sources are equilenin and equilin, both obtained from the urine of pregnant mares. The former is of theoretic importance—it is $\Delta^{1,3,5,6,8}$-oestrapentene-3-ol-17-one, being thus structurally the same as oestrone except that there are two more unsaturated linkages in the molecule. It is important as the first natural oestrogen to be formed synthetically in the laboratory from a relatively simple compound. This was achieved by Bachmann and his colleagues[3] in 1939, using 1-naphthylamine 6-sulphonic acid (which even sounds fairly simple) as their starting material. This work clinched the arguments—previously based on indirect chemical evidence—as to the structure of the oestrogenic hormones. Equilenin had

[1] *J. Amer. med. Ass.*, 1941, **116**, 501.
[2] *Edinb. med. J.*, 1941, **48**, 1.
[3] *J. Amer. chem. Soc.*, 1939, **61**, 974.

already been converted into oestrone *in vitro* by Marker,[4] and both oestradiol and oestriol may be similarly converted by dehydrogenation. Another point to be noted is that all the natural oestrogens are phenolic—that is, the A ring (carbon atoms 1-5) is a phenol ring, which enables them to be separated from the other sex hormones by their solubility in aqueous alkali. They may then be precipitated by using petrol ether, in which, compared with other lipins, they are relatively insoluble. This procedure is the basis of the quantitative fractionation of urinary hormones, which has been proceeding rapidly in recent years.

The commercial preparation of the natural oestrogens has chiefly depended on the collection of large volumes of the urine of pregnant mares, and it is clear that such a procedure, together with the fairly complex isolation of the pure substances from the urine, has accounted for the high cost of the products. This is one of the main factors in the practical importance of the synthetic oestrogens. It is now eight years since Dodds and his colleagues showed that 1:2:3:4-tetrahydrophenanthrene had oestrogenic properties, though to produce the same results as the natural oestrogens nearly a million times the dose had to be injected. Later, however, they showed that a dihydroxy-dipropyl-dihydro-dibenzanthracene had oestrogenic activity which was approaching that of the naturally occurring hormones. These compounds had ring structures in some degree similar to those of oestrone, and it was not until 1936 that Dodds and Lawson showed that the phenanthrene ring structure was not essential for the production of oestrus in experimental animals. The process of simplification of the molecule while still obtaining oestrogenic activity reached its culmination in the discovery of stilboestrol and hexoestrol, which have potency at least equal to that of oestrone and the added advantage of being active by mouth. Stilboestrol (V) is chemically 4:4′-dihydroxy-α:β-diethylstilbene—stilbene being diphenyl ethylene (ethene). Hexoestrol is chemically very similar, being 4:4′-dihydroxy-γ:δ-diphenyl-*n*-hexane. A further active compound in this series is 4:4′-dihydroxy-γ:δ-diphenyl-β:δ-hexadiene. The stilboestrol formula given is arranged so that its analogies with the formulae of the natural oestrogens may be appreciated. The other two compounds mentioned differ only in the degree of saturation of the aliphatic nucleus of the structure; they all contain phenolic properties.



V. Stilboestrol

A few years ago a large number of doctors faced with such chemical terms would have risen in wrath—such wrath perhaps as that shown by the first audiences of Stravinsky. But Stravinsky has now signed a contract with Walt Disney and may soon become a part of the culture of the common people. Similarly we feel that the medical profession of to-morrow will be acclimatized to what are to-day regarded as the esoteric mysteries of the chemist.

[4] *J. Amer. chem. Soc.*, 1938, **60**, 1897.

HOW MUCH VITAMIN D?

The announcement by the Ministry of Food that the amount of vitamin D in margarine is to be doubled raises a number of interesting questions. If x is an unknown quantity, $2x$ remains unknown, even though we are told that $2x$ is equivalent to so-and-so many eggs. For it is a matter of judgment, not to say of opinion, even between experts, how many units of vitamin D make an egg: the problem cannot be disposed of as by counting blue beans. One can hardly deduce from the curiously obscurantist statements made by the Ministry of Food, not only on the vitamin content of margarine but also on the fortification of bread, that we live in a scientific age in which the use of international units permits accurate statements as to the vitamin content of such foods. We have the authority of Davidson and Anderson[1] that vitaminized margarine contains 500 international units of vitamin A and 30 international units of vitamin D per ounce; this statement, publicly made, has never been publicly challenged, though never publicly substantiated. It may presumably be taken as a correct reference to the state of affairs when the book was published; in that event, margarine is henceforward to contain 500 international units of vitamin A and 60 international units of vitamin D per ounce.

It is not intended that margarine shall be regarded as a major prophylactic against rickets in infants, who must continue to depend upon their allocation of milk—whether from their mothers or from Lord Woolton—and the cod-liver oil compound issued by the Ministry of Food, acting, we understand, under the advice of the Ministry of Health. So far as can be made out from the label describing "cod-liver oil compound," the daily dose for children from 2 to 6 months old would supply a maximum of 180 units of vitamin D; for older children the maximum amount would be twice this. In view of the fact that the minimal pharmacopoeial prophylactic dose of vitamin D (calciferol) is given in the 1936 *Addendum* as 1,000 units per day for an infant, one cannot help wondering how the average infant, even at an age when "bread and marg." constitutes a portion of its diet, is going to make do with the Ministry of Food's margarine and the same Ministry's cod-liver oil compound. True, some mothers may purchase out of their own pockets one or other of the more expensive, but more concentrated, proprietary preparations of vitamin D, but we think this is likely to be very rare. In the winter, therefore, the child of 12 months may be receiving daily a pint of milk containing at most 50, but probably not more than 10, units of vitamin D, sufficient cod-liver oil compound to furnish 320 units, and perhaps (on the average) 1/7 to 1/2 of an egg and about 1 to 1½ ounces of margarine and butter—say

[1] *Textbook of Dietetics*, 1940, p. 97, Hamish Hamilton.

another 70 or 80 units, possibly even 100. This is sailing very near the wind, for it amounts in all to less than 500 units per day. Even if the pharmacopoeial estimate has been over-cautious, one still looks with some anxiety at the amount of vitamin D at present available from rationed or free sources for the infant population of this country.

It should be noted that these misgivings are based upon certain calculations, in turn based upon a knowledge of the vitamin content of the particular foods or medicinal products. For this knowledge we have not always got the Ministry of Food to thank. We have already mentioned that figures for the vitamin content of margarine are to be obtained only in a somewhat roundabout manner, and the same is true of figures for the Government fortified loaf. As a speaker pointed out at a recent joint meeting of the Society of Public Analysts and Other Analytical Chemists with the Food Group of the Society of Chemistry and Industry, the principle of disclosure has not yet been accepted in connexion with fortified foods in this country. Until it is accepted, those whose business it is to provide for public health by attention to diets or the official examination of foods are deprived of fundamental information upon which their forecasts or guardianship must be based. How is a local authority to proceed under the Food and Drugs Acts against a vendor of margarine if he does not know the "substance, nature, and quality" that the customer is entitled to demand? We have an uneasy feeling that the failure to tell the public in the most simple language consistent with precision exactly what, and how much of it, is being added to food, and the reasons for the addition, is an expression of a deep-seated undemocratic attitude. Such an attitude needs careful watching by those who have the health of the community at heart. The prognosis is not unfavourable if the right steps be taken early enough. It is only the general public that can take those steps.

INFUSIONS INTO THE BONE MARROW

The problem of administering fluid to infants is often a difficult one. The veins are small and may be difficult to find. The superior longitudinal sinus reached through the anterior fontanelle, though quite a satisfactory route in skilled hands, is not easy for the inexperienced. Tocantins, O'Neill, and Jones[1] have recently therefore advocated the intramedullary route, especially for infants. In adults, Tocantins and O'Neill[2] suggest that this route is of particular value in patients with widespread burns, mutilations, generalized oedema, and circulatory collapse. It may also be useful, they suggest, in circumstances which do not allow the time necessary to find an awkward vein, or when it is difficult to keep a needle in place. For instance, the relative immobility of a needle inserted into a bone might prove of real advantage in a battlefield emergency station or in a delirious patient. The rather elaborate technique which they describe, however, hardly seems adapted to battlefield conditions. They found that in dogs made anaemic by bleeding the blood volume could be satisfactorily restored by injecting citrated blood into the sternum. They record forty-nine intramedullary infusions in human beings—thirty-eight to adults and eleven to infants under 1 year. From 50 to 6,800 c.cm. of various fluids were administered, the needle being left in place for periods varying from seven minutes to thirty-one and a half hours. The average rate of flow by gravity into the manubrium sterni of adults was 3.4 c.cm. per minute, with a range of 0.4 to 25 c.cm. per minute. Gravity was usually sufficient to maintain such a flow, but in one instance as much as 43 c.cm. per minute was given by means of a syringe. In infants under 3 years of age the marrow cavity of the sternum is not large enough to be used, and Tocantins and his colleagues suggest that the upper one-third of the tibia is satisfactory and easy of access. There were no local or constitutional reactions after the infusions. Beyond the period when the needle was inserted and a few c.cm. of marrow aspirated, the infants showed no sign of distress; in fact they often went to sleep. In nine patients the intramedullary pressure was measured before and after the infusion. In no instance was there a significant difference between the two readings. Pressures varied between 40 mm. and 195 mm. of water, and were closely related to the venous pressure taken at the time of the transfusion. In infants, saline and citrated blood were given; in adults, glucose and insulin as well as the more usual fluids. This new use of the marrow as described by Tocantins and his colleagues is certainly ingenious, but will require further testing before it is generally accepted.

[1] *J. Amer. med. Ass.*, 1941, **117**, 1229.
[2] *Surg. Gynec. Obstet.*, 1941, **73**, 281.

PEMPHIGUS

Pemphigus, the serious disease of the skin characterized by the spontaneous development of bullae, is still one of the unsolved problems of dermatology. Even the diagnosis is by no means always simple, for there are other dermatoses which also produce blisters or bullae but which are distinguished from pemphigus by other lesions and run a less malignant course. Quite recently two New York hospitals have provided material for a careful clinical study and analysis, the results of which are now before us. In one instance a series of 170 cases of pemphigus extending over the last thirty years has been studied, and, in the other, seventy-seven cases during the last twenty years. It will be seen that pemphigus is not a very common complaint, the average admission rate being between four and five cases a year to a large city hospital. The investigators in both series agree in describing pemphigus as an almost universally fatal complaint, and in stating that it is found more often among Jews than other races. They are not able to throw any light whatever on its aetiology. As regards the diagnosis, in one series stress is laid on laboratory determinations, but in the other comparatively little has been done in that way. Gellis and Glass[1] state that the blood picture in pemphigus is invariably that of a secondary anaemia with a progressive elevation of the total white count until within twenty-four hours of death; they emphasize the increased sedimentation rates and the heightened toxicity of the blood as expressed by the Pels-Macht index. This index, which has been studied since 1931 in America, is not very well known in this country, and perhaps may be briefly explained. It appears that, whereas normal serum has no retardative effect on the growth of seedlings of *Lupinus albus*, that drawn from cases of pernicious anaemia or of pemphigus affects their development to a considerable extent. The determination of the amount of interference has been worked out by the originators—Pels and Macht—as the phytopharmacologic index of the fluid examined, and Gellis and Glass, who have had this index determined in twenty-seven cases of pemphigus, report that it is consistently high. They regard the determination of the index as of much value in making the differential diagnosis between pemphigus and other similar

[1] *Arch. Derm. Syph.*, Chicago, 1941, **44**, 321.

conditions. On the other hand, Eller and Kest,[2] who have submitted only three cases to this investigation, found that in two the toxic reaction did not conform to the pattern expected from pemphigus, but that both patients died from that disease. Consequently they think it of but little importance.

As has been already indicated by the very high mortality rate in pemphigus, the therapeutic prospects in this disease are very poor. It is impossible to enumerate all the diverse methods of treatment tried in different cases. Among the more modern may be mentioned diets high in vitamin content of various sorts, all of which were useless. The same depressing observation must be made on the use of salvarsan and its many different modifications and also of potassium arsenite given in solution by the mouth. Sulphanilamide seems to have but the most temporary effect on the progress of the disease. The impression left on the mind from reading these papers is that, although remissions are not uncommon in the earlier months of the disease, they occur with much the same frequency with almost all forms of treatment, and indeed even without any treatment at all except local applications. Any temporary improvement recorded must therefore be credited to the patient and not to the drug the physician prescribes. Some of the remedies undoubtedly made the patients worse, and one is reminded of the Hippocratic dictum that the first essential of every treatment is that it should do no harm, although in dealing with a condition with so gloomy a prognosis it is undoubtedly justifiable to take risks. One drug which has been well spoken of in this country, but is not given much prominence in these American series, is suramin (germanin). But with this it now appears that there is risk of injury to the adrenals. According to Humphreys and Donaldson[3] adrenal lesions have been found in patients dying of pemphigus only when they have been treated with suramin. These observers have tested suramin experimentally on the guinea-pig and to a less extent on other mammals; they find that even in small doses comparable to those in therapeutic use in man it may produce zonal degeneration of the adrenal cortex. They point out that it is not enough to be content with gross inspection of the adrenals at a post-mortem examination, but that microscopical study is necessary.

CANADIAN ORTHOPAEDIC UNIT FOR SCOTLAND

Canada has responded to a recent appeal by sending an orthopaedic unit for service in Scottish emergency hospitals run by the Department of Health. Nine Toronto doctors and twenty-two nurses chosen from all parts of the Dominion—all specialists in orthopaedics—arrived with the latest contingents of Canadian soldiers and airmen. They brought with them some special equipment, the gift of the Canadian Red Cross Society, which, with the Canadian Medical Association and the Canadian Nursing Association, organized the unit. Led by Dr. Le Mesurier from the Toronto Sick Children's Hospital, and Miss A. B. Hunter, who was matron at Port Arthur General Hospital, the members of the unit were welcomed by Dr. Andrew Davidson, Chief Medical Officer for Scotland, and Sir John Fraser, Consultant-Adviser in Surgery to the Secretary of State for Scotland. Dr. Davidson said that Scotland before the war had inadequate provision for orthopaedic surgery; now it had the makings of a first-class scheme not only for the present emergency but for the post-war period. Orthopaedic units had been placed at hospitals staffed and equipped for specialized surgical treatment and for remedial and occupational therapy. The organization could be linked up with the schemes of local authorities, and regional orthopaedic councils had been established or were being set up in all districts to co-ordinate the work of responsible authorities. Thus for the first time Scotland had prepared a foundation on which to build a complete orthopaedic scheme, and with the close co-operation of all parties there would soon emerge a fully developed scheme for the treatment and care of cripples. Dr. Davidson added that Scotland's main problem in organizing orthopaedic units was to secure trained personnel—surgeons, nurses, and technicians. Canadian orthopaedists had done excellent work in the last war, when orthopaedic surgery was in its earlier days. "We decided to appeal to Canada again. The Canadian Red Cross Society immediately responded, and it is difficult to find words to express our gratitude to the members of the unit who have given up so much and travelled so far to help us at this time." Sir John Fraser said that he had practical and first-hand knowledge of Canadian medicine and surgery, and knew how high they ranked in the records of our profession.

[2] *Arch. Derm. Syph.*, Chicago, 1941, **44**, 337.
[3] *Amer. J. Path.*, 1941, **17**, 767.

MEDICAL HISTORY OF THE WAR

We announced last week that an Editorial Board, under the chairmanship of the President of the Board of Education, and composed of representatives of the fighting Services, the Ministry of Health, the Department of Health for Scotland, the Committee of Imperial Defence, and the Medical Research Council, has been set up by the War Cabinet to direct the preparation of an official *Medical History of the War*. This Board, which will have the active collaboration of authoritative bodies and experts in its task, met recently and discussed the scope and planning of this undertaking, the value of which as a record of medical work during the war, and of the war's contribution to medical science, will be appreciated. Sir Arthur MacNalty, K.C.B., until recently Chief Medical Officer of the Ministry of Health, has been appointed Editor-in-Chief, and representatives have been appointed by the Service Departments concerned. The collection and classification of material have now begun. Much material on wartime medical problems already exists, and this will increase as the war goes on. The Editorial Board hopes to have the full support and co-operation of the medical profession in its task of collecting data, and would be glad to receive copies of published articles, reports, and other information from medical officers of health and medical practitioners which may be of use in assembling material for the medical historians. Such data should be communicated to the Editor-in-Chief, *Medical History of the War*, Room 208, Caxton House West, Tothill Street, S.W.1.

All members of the British Medical Association, at home and abroad, will be gratified to see the name of Dr. G. C. Anderson in the New Year Honours List as a Commander of the Order of the British Empire.

News has reached this country of the death of Dr. William George Armstrong, aged 82, formerly Director-General of Public Health for New South Wales and President of the N.S.W. Board of Health. We regret to announce, also, the death of Mr. J. Gray Clegg, F.R.C.S., late surgeon to the Manchester Royal Eye Hospital and ophthalmic surgeon to the Manchester Royal Infirmary; he was President of the Section of Ophthalmology at the Manchester Meeting of the British Medical Association in 1929.

NEW YEAR HONOURS

The names of the following members of the medical profession were included in a New Year Honours List published in a *Supplement* to the *London Gazette* on January 1:

Barony

The Rt. Hon. Sir AUCKLAND CAMPBELL GEDDES, P.C., G.C.M.G., K.C.B., M.D., LL.D. Brigadier-General. For public services.

Knighthood

RATANJI DINSHAH DALAL, C.I.E., M.R.C.P. Member of the Central Legislative Council.

SAMUEL GURNEY-DIXON, M.D., J.P. Chairman of the Hampshire Education Committee and Chairman of the Education Committee of the County Councils Association.

C.B. (Military Division)

GORDON GORDON-TAYLOR, O.B.E., M.S., F.R.C.S. Temporary Surgeon Rear-Admiral, R.N.

ALEXANDER HOOD, C.B.E., M.D. Lieutenant-General, late R.A.M.C. Director-General, Army Medical Services.

C.M.G.

HARRY CHAPMAN SINDERSON, O.B.E., M.V.O., M.D., F.R.C.P.Ed. Dean and Professor of Medicine, Royal College of Medicine of Iraq.

THOMAS GEORGE WILSON, M.D.Sydney, F.R.C.S.Ed., F.R.A.C.S., F.R.C.O.G., F.A.C.S. Director of Obstetrics, University of Adelaide. Honorary Consulting Gynaecologist, Adelaide Hospital.

C.I.E.

MADAN GOPAL BHANDARI, M.B., B.S. Lieutenant-Colonel, I.M.S. Inspector-General of Prisons, Bombay.

MARTIN MELVIN CRUICKSHANK, M.D., Ch.M., F.R.C.S.Ed., F.A.C.S. Lieutenant-Colonel, I.M.S. Chief Medical Officer and Civil Surgeon, Delhi, and lately Professor of Surgery, Medical College, University of Madras, and Superintendent, Government General Hospital, Madras.

WILLIAM ELLIOT RANDALL DIMOND, L.R.C.P.&S.I. Lieutenant-Colonel, I.M.S. Lately Officiating Inspector-General of Civil Hospitals, North-West Frontier Province.

ARTHUR HENRY HARTY, M.R.C.S., L.R.C.P. Lieutenant-Colonel, I.M.S. Civil Surgeon and Superintendent, B.J. Medical School, and Superintendent, Mental Hospital, Ahmedabad, Bombay.

ROBERT HAY, M.B., Ch.B.Ed. Lieutenant-Colonel, I.M.S. Deputy Director-General, I.M.S.

C.B.E. (Military Division)

JOHN CECIL ALEXANDER DOWSE, M.C., M.B., B.Ch. Colonel (acting Brigadier), late R.A.M.C.

WILLIAM TYRRELL, D.S.O., M.C., M.B., B.Ch. Honorary Surgeon to the King. Air Vice-Marshal, R.A.F.

C.B.E. (Civil Division)

GEORGE CRANSTON ANDERSON, M.D., LL.D., F.R.C.P. Secretary, British Medical Association.

RICHARD LIONEL SPITTEL, F.R.C.S. Consulting Surgeon, General Hospital, Colombo. For services to medicine in Ceylon.

(To be concluded)

Reports of Societies

CHANGING DOCTRINES OF IMMUNOLOGY

SIR ALMROTH WRIGHT'S ADDRESS

At a special meeting of Fellows of the Royal Society of Medicine on December 12 Sir ALMROTH WRIGHT gave an address entitled "The Need for Abandoning Much in Immunology which has been Accepted as True." The delivery of the address, for a full hour without a note, was a remarkable achievement. Sir Almroth Wright's age is given in *Who's Who* as eighty

The lecturer began by saying that he felt rather like someone to whom a manuscript had been delivered, who had rubbed out the writing and put in other words, and now upon the palimpsest found that something else and something different had to be written. Forty-eight years ago when he became professor of pathology at the Army Medical School, Netley, the doctrine of Pasteur prevailed that prophylactic inoculation could be effective against any infectious disease if the microbe were known. Pasteur would have thought it absurd to inoculate a patient already suffering from the disease, though he made an exception in rabies, because he said that the man bitten had not yet acquired the disease and thus there was an interval for prophylaxis. Pasteur also said that the work must always be done with the living microbe, that it took ten days to produce protective substances—making his inference from Jenner's results—and that perfect protection was not to be expected. That was the doctrine of immunization as stated by Pasteur; it contained many faults, but it was a great improvement on what had gone before, when it was believed that there could be inoculation against small-pox but against nothing else.

At Netley he found hundreds of people back from India convalescent after typhoid, and his first problem was anti-typhoid inoculation. It was out of the question to give the living microbe. Pfeiffer, however, demonstrated that agglutinins were formed after inoculation with the dead microbe, and he (Wright) considered that if one type of protective substance was to be obtained, the same in all probability held good for others. Anti-typhoid inoculation, therefore, was carried out with dead microbes.

The Reaction in Phagocytosis

It was now necessary to examine the accepted doctrine and its logical basis. One of the principles of Metchnikoff was that phagocytosis of microbes took place only in the presence of serum, because when the leucocytes were washed free from serum phagocytic power was lost. Sir Almroth Wright, however, described observations on spontaneous phagocytosis of the staphylococcus in normal persons and in patients suffering from various infections, also on spontaneous phagocytosis in (for the most part febrile) phthisis, from which he drew the conclusion that it was not true that leucocytes could not deal with microbes in the absence of serum. The leucocytes after inoculation were capable of it, and therefore the earlier conclusion needed restatement.

Another accepted doctrine was that the chemical reaction which took place in a phagocytic mixture (corpuscles, serum, and microbes) was an opsonic action, and that other possible chemical actions might be ruled out. But it seemed open to inquiry whether the microbes contained in a phagocytic mixture operated as a vaccine on the leucocytes of that mixture. If microbes and serum were taken and then the operation was suspended, the leucocytes being added afterwards, the same result occurred as with the original mixture, but if the microbes plus the leucocytes were first taken, and the serum added only after an interval, greater phagocytosis was normally obtained, showing that microbes in contact with white blood corpuscles outside the body made those corpuscles more phagocytically active.

Effect of Heated Serum

Serum was regarded as rendered inert by heating to 60° C., this result being due to destruction of opsonins. That was based on a comparison of the effects of heated serum with those of unheated; when the serum was unheated large numbers of microbes were taken in, but when heated, hardly any. When he came to test that view he found that heated serum actually increased the phagocytic power of leucocytes as compared with unheated. In what he called the stimulin or sero-leucocytic procedure, the average phagocytic count in nine successive experiments with unheated serum and leucocytes against the staphylococcus was 1.83, and with heated serum 3.1. Therefore the heating of serum was not a question of destruction of opsonins but of altering the serum in such a way that it became a foreign body to the leucocytes and so increased their phagocytic power.

The immunizing response to bacterial vaccines had been supposed to affect the serum and leave the leucocytes unchanged. He described some chiastic experiments which bore out this view, in contradiction to the view of Metchnikoff that white blood corpuscles became more efficient with immunizing response to bacterial vaccines and that the serum did not matter. Shattock and Dudgeon took a number of patients suffering from infection and tested their corpuscles against those of the investigators by this chiastic method, finding that the leucocytes of the patients were in practically all the cases more phagocytically powerful than their own. These workers, however, had made a general inference, and he himself took the matter further with experiments on his own blood, which he described, and as a result he reached the conclusion that in an inoculated blood sometimes the leucocytes and the serum might both be found

to be improved, and sometimes the serum might have greater efficacy and not the leucocytes. He knew now to a great extent why one result and not the other was obtained in given conditions, but the doctrine he himself had preached, that it was the serum which was affected and not the leucocytes, must be abandoned. Both might be affected.

Action of Vaccines and the Sulphonamides

It had been accepted that the increased phagocytosis brought about by the inoculation of bacterial vaccines was due to an increase of opsonins in the serum, and not to a fabrication and excretion of stimulins into the blood. This idea was founded on the argument from Ehrlich's axiom, that immunization was equivalent to antithetic chemical action, so that bacterial vaccines engendered bacteriotropic as distinct from leucocytotropic substances. But there was now experimental work which showed that a vaccine was a stimulin. If a vaccine were brought near a white blood corpuscle, the corpuscle reacted and became more active. Stimulins were formed when any irritant, microbic or other, was brought in contact with the leucocytes.

Recently public attention had been directed to the results of chemotherapy. It was thought that when sulphapyridine (M & B 693) was introduced the microbe was killed. He set out to discover whether this preparation would also act as a stimulin on the leucocytes. When the leucocytes were combined with the drug and afterwards tested they were found to have enormously increased in power; in other words, sulphapyridine acted as a leucocytic stimulin. In the case of an infected wound it was possible to suppose either that the drug killed the microbe or that it stimulated the white blood corpuscles. But it ought to be possible to say when using it which of these actions was exercised. If it were true that sulphapyridine did good when placed in a wound, it was also theoretically possible that a vaccine placed in a wound acted in the same way. The argument was that when leucocytes were brought into contact with sulphapyridine they improved in phagocytic efficacy, and that must occur in the wound just as much as in the test tube.

Another commonly accepted doctrine was that leucocytes killed microbes only intracellularly. Metchnikoff began his observations on phagocytosis with the ability of protozoa to digest microbes, and declared that leucocytes did the same. He (Wright) fell into that trap and considered that that was the only possible way in which they could do so. But on proceeding to make experiments he found that leucocytes could kill microbes extracellularly. They had the power not only to digest microbes but to throw into the serum protective substances.

Response of Blood in vitro to Inoculation

An idea very difficult to eradicate was that immunization was a difficult procedure and one which could not be expected to take place *in vitro* although it would take place in the body. Metchnikoff held that phagocytosis took place in the body, but could not possibly take place outside. That was now known not to be true, but the same thing could be shown in respect of immunization. Blood, when inoculated *in vitro*, did exhibit bactericidal and phagocytic power. During the last war he (Sir Almroth Wright) had suggested a method of treating septic infection by taking any person's blood, immunizing it against the microbe, and then giving it to the patient, or, again, vaccinating some charitable donor and drawing off his blood for the same use. All these methods of immunotransfusion had gone out if they were ever practised—and they were practised more in France than in this country—in favour of chemotherapy. But it had been shown that the bactericidal power of such a drug as sulphapyridine was very specific and limited to particular microbes, whereas immunization was a procedure applicable to all.

The last question related to the accepted doctrine that the antibacterial substances elaborated in the body in response to inoculations of bacterial vaccines operated only on the microbes which supplied the immunizing ictus. It would have appeared ludicrous to the early immunologists to have suggested that by giving a man a microbe something was effected against a different microbe. Yet white blood corpuscles increased in phagocytic power on coming in contact with microbes, and this must apply to vaccines also. If a vaccine got into the body it increased the killing power of the leucocytes and of the serum, and certainly in the case of leucocytes the increase was in respect of all microbes.

In all immunization (said Sir Almroth Wright in conclusion) there was a non-specific element, which was sometimes the most important element in the case. American workers especially had supposed that in inoculating against one particular pneumococcus, that only and no other was affected. But it was his job to spend nine months in the Transvaal, where inoculation against the pneumococcus was carried out in a large mining population very liable to pneumococcal infections. The vaccine was a non-specific microbe, and at one mine where there had been a 4% incidence of pneumococcal infection in the year there was a reduction within two years of beginning the practice of inoculation to 0.75; there was also a marked and progressive reduction in general infectious diseases among the general population. This seemed to show that the pneumococcus vaccine, in addition to its action against the particular pneumococcus, whatever that might be, had non-specific clinical effects in conditions in which other organisms were concerned.

At the close of the address the President of the Royal Society of Medicine (Dr. A. M. H. GRAY) expressed to Sir Almroth Wright the thanks and congratulations of the large and distinguished company who had attended.

The Oto-laryngologist on War Service.—Major T. A. Clarke, R.A.M.C., fears that a remark he made in a discussion in the Section of Laryngology of the Royal Society of Medicine, as reported on November 22 (p. 744), may give rise to some misapprehension. He spoke of the relative activity of the otologist in the Army as compared with the enforced inactivity of the otologist in the E.M.S. during the first year of war, but he is anxious that this should not be taken as implying a self-satisfaction not felt by him, nor as a gratuitous reflection upon E.M.S. otologists. His remark was made following upon statements of other speakers to the effect that the military otologist was insufficiently occupied.

Correspondence

Duodenal Intubation

SIR,—I have read with particular interest the article on duodenal intubation by Drs. A. Fidler, J. Innes, and Prof. L. S. P. Davidson (December 20, p. 865), not only because this useful test has been so neglected since Lyon introduced it eighteen years ago but also for the reason that in discussion they quote, though incompletely, work with which I was associated as long ago as 1924 and have since continued whenever opportunity arose. The authors' new contribution to the subject is the finding that for this test the 33% solution of magnesium sulphate which Lyon suggested is not the best biliary stimulant to adopt, because, owing to irritation of the intestinal mucosa, the cytology of the specimens is complicated by epithelial cells from the duodenum which, after degeneration, may closely resemble leucocytes. They advocate a 10% solution of peptone as being a good stimulant but non-irritating to the duodenal mucosa. I shall certainly try the effect of peptone in a series of possible enteric carriers under investigation here at present. But in justification of the reliability with which many have credited this test in the past I would meanwhile mention one or two practical points.

In our first series of 100 intubations (Venables and Knott, 1924) we used, and are consequently taken to task by the present authors, a concentration of only 25% magnesium sulphate and in relatively small volume (10 c.cm.), because (*a*) Meltzer's original observation (1917) showed this strength to be sufficient to cause contraction of the gall-bladder, and (*b*) we wished to avoid excessive dilution and local irritation. In our report we remarked, when referring to duodenal contents, "In inflammatory conditions of the duodenum and biliary passages one frequently sees groups of such [intestinal] epithelial cells apparently detached *en bloc*, and this seems particularly to occur in specimens obtained after the administration of magnesium sulphate, suggesting that this solution tends to detach the already weakened epithelium but hardly affects it when in its normal

state." Although it now seems that in our concluding suggestion we may have gone too far, we appreciated from the outset that local irritation did take place. This fact was taken fully into consideration during a subsequent more complete analysis based upon the results of eight years' routine work (*Guy's Hosp. Rep.*, July, 1933). I then reviewed the results of duodenal intubation in 200 cases of definite gall-bladder disease, from seventy-three of which the gall-bladder was subsequently removed and examined in detail. As the present authors do not make any reference to this more recent note, one might mention that we still found a 25% solution of magnesium sulphate to be quite effective as a biliary stimulant, and that it was necessary only to increase the volume injected to 50 c.cm. or so in order to procure, still avoiding gross irritation of the duodenal mucosa, typical distinct samples of bile A, B, and C. Our laboratory results show no evidence at all that we recorded the presence of leucocytes with any undue frequency. If the risk of mucosal irritation and of confusing detached intestinal cells with leucocytes were really as great as Fidler, Innes, and Davidson suggest, it is surprising to find that, in spite of using magnesium sulphate, we came to the conclusion that "leucocytes are seen only in the relatively acute forms of [biliary tract] inflammation and are rare in this series"; actually they were reported in only 4% of the cases.

When, in fact, one examines the damaged intestinal cells illustrated in Fig. 3 of the authors' paper, a photograph taken at the magnification we have always adopted for these examinations, the resemblance to leucocytes is surely very superficial. It is difficult to imagine that the practised observer would seriously record them as pus cells derived from an active inflammatory focus. Taking pathological gall-bladders as a whole, relatively few carry free leucocytes. We found them entirely absent when a surgically removed infected gall-bladder from a biliary enteric carrier was immediately examined in the laboratory. Moreover, when leucocytes are present, as in the case of really active inflammatory cholecystitis, our experience has been that, even in the presence of what remains of the magnesium sulphate after the bile has started to flow, the polymorphs are seen as typical in microscopical appearance as when they are encountered in any other freshly formed inflammatory material.

I have no doubts concerning the possible advantages of a completely non-irritant biliary stimulant. It would certainly give "cleaner" specimens in a cytological sense, but I cannot agree that the magnesium sulphate we habitually used during duodenal intubation has in practice given rise to any serious fallacies in deciding whether fresh pus cells were being formed in the biliary tracts.—I am, etc.,

Guy's Hospital, London, S.E.1. F. A. KNOTT.

Regimental Medical Officers

SIR,—The Army has absorbed and is still absorbing a number of qualified men. These doctors vary greatly in age and in length of qualification and experience in hospital and in general practice. Some will have been qualified only for a short time and have completed one hospital appointment. Others have been qualified for three or four years, have held several appointments, and see the way opening to the ladder which leads to the coveted eminence of consultants. Others again have been in general practice for ten or more years, and have had added experience of the world to the lore of the hospital. From each of these diverse groups a considerable proportion become regimental medical officers. It is not surprising if the experienced practitioner and the promising hospital alumnus alike consider that their accomplishments will not be put to their proper and fullest use if they are placed in posts which are also occupied by recently qualified men.

The opinion has become widely held that the duties of a regimental medical officer involve no requirements and offer no scope beyond the knowledge, experience, and judgment of a man who has been qualified for six months, and that others are being bureaucratically under-employed if placed in these posts. The hospital alumnus will write to the War Office: "I feel that my special training during three years in hospital will be wasted as an ordinary regimental medical officer." The general practitioner will write (but less frequently): "I feel that my experience in general practice will be more useful in a hospital." The hospital authority desiring to retain a special man writes: "This is a man of experience and judgment whose training will be wasted as a regimental medical officer."

Such views are based on a misapprehension. The health and physical efficiency of the Army lies not in the hands of the hospital surgeon and physician or others of higher rank, but in those of the regimental medical officers. To perform their duties efficiently requires considerable judgment and knowledge, and many units have suffered from medical officers who may work conscientiously but have insufficient experience. The responsibilities are especially heavy in a training centre, and the day's work may be long. The medical officer has to "mother" the recruit over teething troubles—from sore feet to home worries and the anxieties of a new environment—and his hand must be neither too heavy nor too light. A weak medical officer can reduce mediocre men to complete inefficiency, or aid them as they slip willingly downhill. A good regimental medical officer can do more for man-efficiency and man-power than any other officer in the R.A.M.C.

The duties of a regimental medical officer are laid down in the Regulations for the Medical Services of the Army. The pages form a somewhat bald and unconvincing narrative, for no touch of human nature is discernible, and so medical officers, like all doctors, must learn their most important lessons outside the covers of a textbook. But one sentence may be quoted: "He [the M.O.] is the adviser to the O.C. unit on all medical matters pertaining to the health of the unit." This is strictly true, and its importance is obvious. The position should be reciprocal, and in the best units the O.C. is equally the adviser to the medical officer, and consequently a good O.C. usually has a good medical officer. But if the medical officer is too junior and inexperienced he has to struggle for himself with the same difficulties which he is expected to cope with in others, and the position is fair neither to himself nor to the men, nor is it to the benefit of the Army or the State. Consequently it is essential that it should not be considered that training and experience are wasted in these important posts, and that a sufficient supply of suitable men should be available, for, I repeat, the health and physical efficiency of the Army lies in the hands of the regimental medical officers.—I am, etc.,

H. LETHEBY TIDY,
Colonel; Consulting Physician to the Army at Home.

Economy of Medical Man-power

SIR,—Mr. McCurrich's suggestion (December 6, p. 826) that an A.T.S. officer might be appointed to the office of D.A.D.M.S. of a Division conjures up a vision of the joy with which such an appointment would be hailed in every Divisional Headquarters mess and of the warm welcome she would receive. But would such an appointment be workable?

During part of the last war I was D.A.D.M.S. of a Division, and on March 21, 1918, my chief happening to be on leave, it became my duty to hand over the medical arrangements of our sector in the Houlthoust Forest to the Belgian Division relieving ours, and to issue the orders for the move, at a few hours' notice, of the three field ambulances of our Division to the Arras district. I was informed by the D.A.A.G. of the Division of the place and hour of the departure of our train, of the place and anticipated time of its arrival, and of the area around Arras in which each brigade of the Division would take up its position. An intelligent A.T.S. officer with this information would no doubt have been capable of issuing satisfactory orders to each field ambulance for the move, provided she was familiar with the routine working of such a unit, which knowledge, however, could be acquired only by having worked as one of its officers. It follows, therefore, that before being appointed D.A.D.M.S. the A.T.S. officer should have had experience as an officer in a field ambulance.

Further, one of my routine duties as D.A.D.M.S. was to keep in close touch with all the regimental M.O.s of the Division. This, which was often helpful to them when things in the front line were quiet, was of great importance when active conditions arose, as it was the best means of ensuring that no hitch in the evacuation of the wounded occurred. The journey up to the regimental aid post in the middle of a "strafe" or even as soon as things began to settle was, however, often the reverse of pleasant. Probably the A.T.S. officer would be willing to make such journeys, but I do not think that it could have been Mr. McCurrich's intention to ask her to do so.

These reasons against the appointment of an A.T.S. officer as D.A.D.M.S. of a Division are based on my experience in the last war, but appear to gain added weight from the increased mobility of divisional units in the present struggle. Owing to the personal note in this letter I would ask to be allowed to subscribe myself as

A FORMER D.A.D.M.S.

Voluntary Hospitals

SIR,—The most interesting correspondence on this subject has focused chiefly on the teaching hospitals in the big cities. Little has been said about the value of voluntary hospitals in the Provinces. Yet the provincial hospitals far outnumber the teaching hospitals. There are 750 voluntary hospitals in England and Wales outside London and only 158 in London.

The provincial voluntary hospitals have many fine features; most of them have serious defects. There are three or four factors which make the voluntary hospital system in the Provinces out of date. First, most town populations are increasing, some gradually, some very rapidly. The increasing population makes increasing demands on the local hospital. I settled in a small seaside town twenty-one years ago. This town has continually increased in size. The hospital, to whose staff I was appointed, was built eighteen years ago. It was considered large enough at the time, but every few years additions and enlargements have had to be made. There have been financial struggles and constant appeals for money until the residents are sick and tired of the name of the hospital. Even now there is a list of much-needed improvements. It is obvious that voluntary hospitals have great difficulty in meeting the growing demands of a growing population. Secondly, general enlightenment and education are affecting the position. The public are no longer frightened of hospitals; they are more "hospital minded." There is thus a bigger demand for admission. There is generally a waiting list (often a long one) at every hospital. Are the voluntary hospitals able to meet this demand for more beds? Thirdly, the extension of social services has had its effect. County and borough councils are now under an obligation to see that the health and hospital services are efficiently supplied in areas under their control. Increasing population in many towns means more wards; often the voluntary hospital cannot rise to this demand and the municipality has to step in.

One or two of the advantages of the voluntary system in the Provinces have not been mentioned. (1) The contributory schemes are not only a financial asset but are good for the morale of the inhabitants. People value hospital services for which they pay; they are interested in and can criticize the management, which leads to efficiency. (2) The *Hospital Year Book* for 1941 says there is a remarkable steadiness in the way in which hospitals are supported by voluntary gifts. This generosity is a fine humane impulse; surely it is a good feature. (3) It is a good thing, too, for a hospital to be managed by a local committee who know the needs of the locality and the financial position of the patients, and who can deal with appeals and complaints. (4) It is also surely good for a town that the staff of a hospital should be appointed by a local committee from well-qualified men practising in the town. It is the prospect of appointment to a staff that attracts able doctors to settle in the locality. Would this principle be followed if the State took over?

A plan for reorganization of and help to provincial voluntary hospitals will no doubt be evolved, and as a constructive effort I suggest the following scheme: The formation of a County Council Hospital Department or Ministry of Health Central Hospital Board which would function with a representative local hospital committee in each town, much on the same lines as the Board of Education works with the local town education committees. The local hospital committee would consist of two or three members from the following groups: (1) Leading citizens, (2) town council members, (3) contributory scheme members, (4) doctors, (5) industry and labour, (6) religious denominations. It would be a statutory committee and entirely responsible for efficient management. Financially it would be responsible for patients' payments, contributory scheme payments, gifts, legacies, and income from special appeals. The Hospital Department or Board would make grants for extensions and improvements, etc., but would expect the local committee to contribute a portion. It would approve plans and would pay for special services such as dental and ophthalmic work among school children, tonsil operations, etc. It could appoint a qualified inspector; also in big hospitals it could appoint a medical superintendent who would work with the local committee and whose duties would be only administrative and clerical. The local committee would make the appointments to the medical and surgical staff as vacancies occurred, on the recommendation of the medical staff committee; the appointment might be submitted for approval to the Hospital Department.

There would, of course, be the danger of the Hospital Department getting complete control, but local town councils and local education committees function well under a similar system, which allows full freedom to individual towns to manage their own affairs. Such a Hospital Department should give support and control with the minimum of interference with local action and needs. What the medical profession and the staffs of provincial hospitals dislike is being controlled, overridden, and disregarded by a public assistance or health committee of a county council which acts on the advice of county medical officers who generally have less knowledge of hospital work and organization than they have and less knowledge of local needs.

My own experience of regional and central committees is that it is difficult to get members to attend regularly, meetings are few and far between, long discussions take place without results, and they do not always have smooth and sympathetic relations with county councils. Moreover, when one representative from each hospital is present, small hospitals have not enough weight to press home their needs.—I am, etc.,

G. T. BIRDWOOD.

Wartime Rationing and Children's Health

SIR,—In the interests of accuracy I should be grateful if you would publish this emendation to the report in your issue of December 27 (p. 920) of my remarks at the discussion in the Diseases of Children Section of the Royal Society of Medicine on wartime rationing and children's health. I am afraid that compression produced an alteration in meaning.

Shortage of food for the pregnant woman affects first her stores and then her weight, the infant *in utero* benefiting at the expense of the mother. More severe shortage results in the foetal stores, particularly iron, being low at birth and giving neonatal complaints, while extreme shortage yields low birth weights. The term "shortage" refers to gravimetric shortage and not to a temporal shortage—that is, moderate deprivation over a long period does not appear to lower the birth weight. A pilot survey of birth weights in a few London hospitals in 1938 and 1941 has shown a loss of weight in certain areas, but none at all or a gain in other areas—certainly not a clear result indicating definite gross dietary deficiency.

Ascorbic acid alone as a substitute for fresh vegetables and citrous fruits in the human dietary is a little doubtful, since it omits the possible therapeutic advantage of vitamin P in the prevention of infantile scurvy and scorbutic lesions.—I am, etc.,

St. Mary's Hospital, W.2. A. ST. G. HUGGETT.

Sulphonamides for Ophthalmia Neonatorum

SIR,—In view of the letters of Dr. W. J. Clancy (November 22, p. 749) and Dr. L. B. Somerville-Large (December 20, p. 887) suggesting that local treatment is of little importance in cases of gonococcal ophthalmia, the possibility of drug resistance in occasional cases should be remembered.

Ten cases of gonococcal ophthalmia have been seen here during this year, one of which has proved refractory to sulphapyridine. This particular case—a child of 18 months—was admitted six weeks ago, only one eye being affected. The administration of sulphapyridine in adequate dosage accompanied by careful and frequent local treatment was followed by relief of the palpebral oedema and chemosis. The discharge had very nearly ceased by the fifth day. Sulphapyridine was continued until the ninth day because of the residual injection of the sclera and palpebral conjunctiva. Concomitant local treatment was reduced to four-hourly lavage, atropine instillations being continued once daily.

Immediate relapse followed the cessation of sulphapyridine, as evidenced by the recurrence of profuse discharge, etc. Local treatment and vaccines were followed by slow improvement, and

further sulphonamide therapy was under consideration in view of the curative value of this procedure in cases of genito-urinary relapse. Progress in this case became, however, accelerated, and ended in a recovery during a feverish cold. The temperature remained elevated for four days and once touched 103° F.—an interesting sidelight on the value of fever therapy, if that were practicable by mechanical or other therapeutic means in the case of a young child.

The story of this case suggests that it is unwise to disregard the importance of concomitant local treatment. I should add, to forestall possible inquiries, that, supplies of sulphathiazole not being available locally, this could not be tried.—I am, etc.,

F. G. MACDONALD,
Assistant Venereal Diseases Officer.

Newcastle-upon-Tyne.

Endocrine Therapy of Hypertrichosis and Acne

SIR,—I believe that hypertrichosis and acne vulgaris are usually, if not always, based on a general metabolic disturbance, often of neuro-endocrine basis. The fact that they are found in intersexual conditions of endocrine origin and that they disappear when such conditions are treated by appropriate endocrinotherapy and other constitutional methods is one of the many proofs of this conception. Dr. A. C. Roxburgh's statement (December 20, p. 890) and that of the "authorities on endocrinology" whom he has consulted as to the impossibility of curing hypertrichosis or acne by means of hormones are not confirmed by my clinical experience or by that of many others. I have not available all the references on the subject, but at random I can quote the following, of whom the first is one of the greatest living authorities on endocrinology: Mussio-Fournier, J. C., *Presse méd.*, May 27, 1939; Rosenthal and Kurzrok, *Proc. Soc. exp. Biol. Med.*, **30**, 1150; Van Studdiford, *Arch. Derm. Syph.*, 1935, **31**, 3; Lawrence, C. H., and Feigenbaum, J., *New Engl. J. Med.*, **212**, 26; and a very recent paper in the *Journal of the American Medical Association*, the precise reference to which escapes me.

In speaking of the treatment of acne or hypertrichosis by constitutional methods (I do not speak only of endocrinotherapy because the method as practised to-day is useless, for it must be applied as part of a general constitutional treatment) one must remember that everything here depends on diagnosis. If the authorities mentioned by Dr. Roxburgh have tried at random all the hormones on the market on cases labelled simply "acne vulgaris," no wonder that they obtained no result. There is no hormone for the cure of acne, but there are hormones which cure basic metabolic conditions of which acne is a manifestation. These metabolic conditions vary. Thus I have seen acne treated successfully by thyroid, by oestrogens, by chorionic gonadotropin, and by progestin. Success, then, depends on whether we have diagnosed correctly the basic metabolic condition and have treated it adequately. I must add that these deep constitutional diagnoses are difficult, for up to now we have been educated to diagnose "heart" or "stomach" but not the whole man. Thus constitutional treatment, including endocrinotherapy, also is very difficult, long, and exacting, and requires great knowledge of metabolic physiology. However, that such treatment gives results in acne vulgaris and hypertrichosis as well as in many other local conditions of constitutional basis, there can be no doubt.—I am, etc.,

A. P. CAWADIAS.

London, W.1.

SIR,—May I give my full support to Dr. Roxburgh's criticism of Dr. Cawadias's Thomas Vicary Lecture.

"Thanks to a few hormonic injections" repulsively feminized boys cannot be changed into normal virile adolescents, nor "thanks to oestrogenic hormone therapy" can girls with hairy faces and bodies and thick and acne-ridden skin be changed to beautiful and complete womanhood. We may be on the verge of such success, but we have not yet achieved it.

I know of no method more capable of destroying all faith in the practice of endocrinology than such statements, beautiful perhaps as prose poems but born of pious hopes, not of their fulfilment. Endocrine treatment can do much already, and every year does more. Dr. Cawadias does a disservice to endocrinology by lending the weight of his authority to claims which it cannot yet support.—I am, etc.,

RAYMOND GREENE.

Endocrine Clinic, Westminster Hospital.

Epidermophytosis

SIR,—The interesting observations upon the comparative merits of iodine ointment and other measures in the treatment of ringworm infection of the feet in South Africa by Captain B. G. Shapiro (December 20, p. 877) may draw attention to the increasing incidence of ringworm infection of groins and toes in other Services. Ringworm of the groin can most readily be cured by the application of the following paste to the affected sites on three successive days, baths being avoided during this period: derobin (Glaxo) or cignolin (Bayer) 2 grains; acid. salicyl. 10 grains; zinc oxide 120 grains; starch 120 grains; paraff. moll. ad 1 oz.

The reaction—reddening and staining of the skin—clears readily when baths are resumed. The treatment is effective in early cases of ringworm of the toes, but chronic cases call for additional measures, among which superficial *x*-ray therapy is most valuable.—I am, etc.,

JOHN INGRAM, M.D., F.R.C.P.

Leeds.

The Stimulant Action of Iron

SIR,—Your annotation on the stimulant action of iron (November 29, p. 776) may give rise to serious concern among persons responsible for the health of women during pregnancy.

A survey carried out during the last six months in the antenatal department of a large Kentish hospital to determine the haematological condition of otherwise healthy women of the upper artisan and lower middle class revealed that their haemoglobin was lower than in an apparently comparable group examined by Mackay before the war. Five hundred and sixty-six women seen during the second trimester of pregnancy showed an average haemoglobin of 77.6% (Price-Jones Haldane scale). Of these 17.7% showed haemoglobin levels below 70%, a proportion slightly higher than the Aberdeen figures on women in poorer circumstances. Follow-through observations on these women showed that the administration of iron in full dosage converts the tendency to fall into a satisfactory rise, rendering them in good condition for delivery and improving their subjective symptoms. With the present difficulties of diet, especially the shortage of the iron-containing foods, it would be undesirable for the therapeutic administration of iron in these cases to be stopped.—We are, etc.,

H. A. HAMILTON.
HELEN PAYLING WRIGHT.

Farnborough, Kent.

Vitamin B_1 and Toxaemias of Pregnancy

SIR,—I was very interested in your survey (November 15, p. 703) of Mr. W. C. W. Nixon's Blair-Bell Memorial Lecture on diet in pregnancy. May I take this opportunity of expressing the hope that Mr. Nixon's important investigations on vitamin B_1 deficiencies in pregnancy in this country will stimulate us to further work on the problem of toxaemias in pregnancy.

Having been engaged in investigations of toxaemias in pregnancy in Czechoslovakia, I published my first results about vitamin B_1 deficiencies in pregnancy and the successful treatment of severe toxic hyperemesis gravidarum with vitamin B_1 in 1938 (*Zbl. für Gynäkolgie; American Yearbook of Obstet. and Gynec.*, 1938). I proved then the importance of vitamin B_1 for the disturbed carbohydrate metabolism in toxaemias and the relationship between vitamin B_1 and the adrenal cortex hormone. The latter was hitherto used alone in the treatment of hyperemesis gravidarum with varying results. From clinical and experimental studies it is becoming clear that many toxaemias of pregnancy have to be regarded as B_1 deficiency and disturbed activity of the pituitary gland and adrenal cortex.

A. C. Sidall's excellent study of eclampsia and B_1 deficiency (1938), the chemical research of W. Neuweiler (1939) about the B_1 metabolism in pregnancy, the puerperium, and toxaemias, in which 100% of the latter showed disturbances of B_1 excretion in the urine, are evidence that there is an established correlation between toxaemias and B_1 metabolism. The recent papers of E. Chalmers Fahmy in Edinburgh and A. J. Ballantyne in Glasgow on hyperemesis gravidarum have given further support to the view that lack of vitamin B_1 is an important factor in the aetiology of this toxaemia.

There are, we know, several factors in the causation of toxaemias. The lack of B_1 vitamins may be one of the main

links in the pathogenesis of pregnancy toxaemias, particularly in hyperemesis gravidarum. In this disease a state of inanition and altered hormonal conditions associated with pregnancy lead to B_1 deficiency. In consequence, an increased B_1 utilization is set up with damage to the tissues. Evidence of this is found in the clinical picture of B_1 deficiency in large numbers of patients and the prompt therapeutic response to administration of synthetic vitamin B_1. Most of us seem to under-estimate the need for B_1 in the function and life of the cells; if there is the slightest shortage the cells suffer and disease follows (Williams, Peters). H. L. Sheehan in his recent pathological work on fatal cases of toxic hyperemesis proved this conclusively.

Mr. Nixon's recent research is certainly of great importance in relation to the whole question of diet in pregnancy, especially under wartime conditions. The abundance of toxaemias in the last months treated in our hospital and in the ante-natal clinics of the Surrey County Council suggests malnutrition in this area. Our results with B_1 treatment in different types of toxaemias in pregnancy are very encouraging, but it is too early at present to draw definite conclusions. Fuller clinical study of a large number of patients is necessary and is being carried out by the whole department under Mr. J. V. O'Sullivan.—I am, etc.,

WALTER SPITZER,
M.D.Prague, M.R.C.S., L.R.C.P.
County Hospital, Kingston-upon-Thames.

Macrocytic Anaemia after Gastro-enterostomy

SIR,—The article on macrocytic anaemia following gastro-enterostomy by Drs. N. S. Gordon and J. Japa (November 29, p. 769) is helpful in establishing a possible relationship between gastro-intestinal dysfunction and subsequent development of pernicious anaemia. It is evident that achlorhydria is not a *sine qua non* of pernicious anaemia and that Castle's intrinsic factor might be absent when there is hyperchlorhydria.

I have a patient under treatment for pernicious anaemia (with subacute symptoms) who has been suffering from chronic gastric ulcer for several years and who was under treatment in the Cardiff Royal Infirmary for this condition in November, 1936. Cholecystectomy was done the following month. In June, 1938, the diagnosis of pernicious anaemia was established following an operation for excision of an old (22 years) appendicectomy scar which had herniated. He reacted well to liver therapy. Three months ago he had a severe attack of ulcer pain, which was soon followed by a recrudescence of marked macrocytic anaemia. It appears possible that the production of intrinsic factor might be interfered with by gastric (and, possibly, by hepatic) lesions, in addition to being a sequel of gastro-enterostomy.—I am, etc.,

Llanharan. BEN SAMUEL.

Sciatic Pain

SIR,—I have read with great interest the leader (*Journal*, November 15) on sciatic pain. Unfortunately the writer has apparently overlooked some papers bearing on this subject, although published in this country. In a letter to the *Lancet* (August 2, 1941) I have remarked very briefly on sciatica. In my experience one has to distinguish between a true or nervous sciatica—which is apparently very rare—and a pseudo-sciatica or muscular sciatica, which is very common indeed. In the *Lancet* (1940, **2**, 326) and *Practitioner* (1941, **146**, 167) I have described muscular sciatica as due to a myalgia of hip muscles. The muscles affected are as a rule the quadratus lumborum, gluteus maximus and medius, tensor fasciae latae. The disease can be diagnosed objectively by what I termed "myalgic spots." The diagnosis can be confirmed conclusively by injection of 1 to 2 c.cm. of 1% procaine into each myalgic spot. Provided the myalgic spots are accurately located and properly injected a permanent cure can be effected within a short time.

In the Army I have treated so far more than 400 cases of myalgia; among them were fifty cases of hip myalgia which caused the syndrome of sciatic pain. In some cases scoliosis, wasting of muscles, and absent ankle-jerk were found. All cases of sciatica but one could be cured in a short time. This case, still under treatment, was proved by means of pentothal anaesthesia to be due to simulation of sciatic pain. I have not been able to publish my results on sciatica and other forms of so-called neuritis because the most prominent medical journals have been suffering for many years from lack of space.

A very important point requiring elucidation is the term "tender spots," very often used in the literature. The diagnosis depends on the fact that the spots are tender to pressure—that is, the patient complains of pain on pressure. But evidently the diagnosis is thus based on a subjective phenomenon, although most of the authors do not appear to have realized it. In addition, experience has shown that sensitiveness to pain varies greatly in different subjects or patients. There are "normosensitive," hyposensitive, and hypersensitive patients, probably owing to the fact that the threshold of pain differs individually.

Now medicine is, or ought to be, practised on the lines of an applied science. It must, therefore, be our endeavour to base our diagnosis on objective criteria whenever possible. On the other hand, I have based the diagnosis of myalgia on "myalgic spots," which are located in anatomical points of a muscle and characterized by objective criteria independently of what the patient says. The explanation of the fact that myalgic spots in quadratus lumborum, glutei, and tensor fasciae latae muscles give rise to pain referred to the posterior aspect of thigh and leg is apparently to be looked for in the law of dermatomes. Clinical observations have shown that pain as mapped out by the patient himself is delineated at least approximately in skin areas supplied by segments of the spinal cord—so-called dermatomes—and originates in muscles supplied by the same segments. Now the quadratus lumborum is supplied by L 1-4, gluteus maximus by L 4-5 and S 1-2, gluteus medius and tensor fasciae latae by L 4-5 and S 1—namely, those segments of the cord which supply the posterior aspect of thigh and leg down to the heel.

The pathology of myalgias—rheumatic, traumatic, or idiopathic—is unfortunately not known at present. But an inflammatory process—a myositis—appears to me to be an assumption which does not account for the facts as known to-day. It is a fact that injection of 1 to 2 c.cm. of a 1% procaine cures the myalgic spot definitely and permanently. It is extremely unlikely that a local anaesthetic will cure an inflammatory process in a muscle of any other organ without delay. On the other hand, I have tentatively put forward (*Brit. J. phys. Med.*, 1938, **1**, 302) the working hypothesis that the clinical or dynamic pathology of myalgias consists in a localized or circumscribed relative vasoconstriction, confined to the myalgic spots only and due to stimulation of sympathetic vasoconstrictor fibres. It would appear that this hypothesis accounts for the main symptoms of the disease—namely, (1) pain, (2) temporary loss of power (paresis), and (3) paraesthesiae (pins and needles, etc.). Owing to lack of space I cannot discuss here the theory of the procaine effects. The whole theory of pain and its control by procaine will be given *in extenso* as soon as it is possible to publish a paper of so theoretical a character in the medical press.—I am, etc.,

M. GOOD, M.D.,
Lieut., R.A.M.C.

Sacro-iliac Strain

SIR,—The excellent article by Dr. James Cyriax under this heading (December 13, p. 847) introduces some points of anatomical interest which do not appear to be appreciated by the author.

He states that "the sacro-iliac joint is like the acromio-clavicular joint in that no muscle spans it; hence it relies for stability on its capsular ligament alone." He later includes the sterno-clavicular joint in this category. The sacro-iliac joint is most certainly spanned by muscles, as is the acromio-clavicular joint (deltoid and trapezius) and the sterno-clavicular joint (sterno-mastoid).

Orthopaedic surgeons tell us that there is no ligament in the body "worth a damn" when subjected to strain, and, while this sweeping statement might be challenged, it contains more than an element of truth. It is certainly true that no joint in the body relies for its stability on ligaments alone. Few joints are subjected to such severe strain as is the sacro-iliac articulation, and if it had to rely for its stability solely upon its capsular ligaments we should soon be forced to revert to the pronograde position, for the capsular ligaments of this joint are notoriously thin and weak. Fortunately Nature has materially strengthened her defences in this region by the provision of: (1) exceptionally powerful extracapsular ligaments (namely, the long and short

posterior sacro-iliac and the interosseous sacro-iliac ligaments), and by equally powerful accessory ligaments (namely, the ilio-lumbar, the sacro-spinous, and sacro-tuberous ligaments); (2) by muscles which span the joint—for example, multifidus, sacro-spinalis, gluteus maximus, piriformis, and iliacus; (3) by an ingenious interlocking device between the articular surfaces (one of the most important factors in stabilizing the joint and not referred to by the author).

While Dr. Cyriax mentions that the laxity which sometimes occurs at this joint does not affect men, he offers no explanation of the fact. The explanation is that this joint needs to be stable in men in order to withstand the strain of hard manual work, while it needs to be mobile in women in order to perform the function of child-bearing. The joint therefore tends to ossify early in men, but I have yet to see it ossify in women at any age.—I am, etc.,

Birmingham. C. F. V. SMOUT.

Regional Anaesthesia

SIR,—I was very interested to read the article by Dr. N. R. James and Mr. H. W. Burge on regional anaesthesia in acute abdominal surgery (December 27, p. 906) as it renewed the "posterior approach for splanchnic anaesthesia" which I described in the *Lancet*, 1924, and before the Royal Society of Medicine in 1925, and which I have abandoned for spinal anaesthesia by the technique which I described in the *Lancet* in 1938.

The authors make the statement, which is so often made, on what grounds I do not know, that "the liability to grave falls in blood pressure and the risks of sudden collapse make spinal anaesthesia (subarachnoid block) unsafe except in comparatively fit patients." In my article in 1938 I recorded 1,250 cases under spinal anaesthesia combined with evipan, in none of which did this bugbear arise, and the list contained many surgical emergencies. Consistently since 1938 I have continued to use the method, as have my colleagues in Portsmouth, and I use it in all my surgical emergencies and rarely consider a patient unfit for the method. If they are unfit for anything it is the evipan, not the spinal anaesthetic. In my work on posterior splanchnic block I found a very definite fall in blood pressure during the first twenty minutes, so that I do not consider that the method described abolishes this risk.

If any form of regional anaesthesia is to attain a useful status it must be simple and easy to learn and involve no complicated movements of the patient prior to operation. I do not think that this new method answers to these requirements, for in order to inject the second side of the splanchnic area the patient has to be turned over completely—a point not made clear in the article. I tried to inject the opposite side without moving the patient, but it is practically impossible; perhaps the authors can do this, but it could only be attained by the expert and after long practice. That raises the point that the posterior approach is not simple or easy to learn; it requires much practice on the cadaver, using methylene blue to check results.

My personal opinion still is, after having used anterior and posterior splanchnic block combined with paravertebral or intercostal or abdominal field block, that there is no better anaesthesia than spinal anaesthesia, using 1 in 1,500 percaine by the Etherington Wilson technique, combined with evipan, as I described in 1938.—I am, etc.,

Portsmouth. O. STANLEY HILLMAN.

Health of T.N.T. Workers

SIR,—I have read with very great pleasure and satisfaction the letter of Dr. H. G. B. Castellain (December 20, p. 889), and feel sure it will be welcomed by all who, like myself, are concerned that the lessons of 1915-18 should be applied to the recurring T.N.T. problem of to-day.

From my own experience I can heartily endorse almost all that Dr. Castellain has to say. On one question, however, I have arrived at an opposite conclusion, and it is a question of great importance from its bearing not only on health but on something of equal if not of even greater urgency—output. Dr. Castellain believes in "alternation" of labour—fourteen days on T.N.T. work and fourteen elsewhere. I, on the contrary, believe that in a factory *where all preventive measures are carried out* alternation is not only unnecessary but is an unjustifiable interference with output and with the technique of poison prevention. In support of this view I venture to quote the following extract from the Official History of the Scottish Filling Factory (No. 4 National), page 179:

"*Alternation*.—In connexion with the prevention of T.N.T. poisoning, the plan of weekly or fortnightly alternation of workers was recommended and was at first adopted in the factory. With the improvement in measures for cleanliness and the education of workers alternation was thought to be unnecessary, and after a gradually progressive experiment to test the wisdom of the step it was decided to employ workers at T.N.T. processes without alternation. Alternation was always objected to by the management as oppressively expensive and antagonistic to efficient work and good output; it was also found to prevent the proper education of workers with regard to the dangers of T.N.T. and the precautions against poisoning on which so much stress was laid in the factory. A worker or overlooker had no sooner mastered the technique of cleanliness and grown accustomed to the almost automatic carrying out of preventive measures than she was removed to a totally different type of work, and by the time she resumed most of what she had learned was forgotten. The effect on the observance of health regulations was just as disastrous as the effect on quality of work and output. It was therefore decided to discontinue alternation, and during the last year the continuous method of working was in force throughout the factory. It is to be noted that during this period no single case of T.N.T. poisoning occurred among the workers."

One point not mentioned by Dr. Castellain, but to which I attach great importance, is the safeguard provided by a suitable respirator continuously worn. It was only after considerable experiment that a respirator was devised which the workers wore willingly and without discomfort. In the early days of all factories, before ideal conditions are established, such a safeguard is invaluable. In the Scottish Filling Factory its use was, in fact, continued till the end of the war. During much of this period it may have been superfluous, but it gave an added sense of security and its educational value was immense.—I am, etc.,

Glasgow. ELIZABETH FRASER BUTLER.

Prophylactic Use of Trusses

SIR,—In view of the emphasis recently laid on the importance of accuracy in certification it may be of interest to record the following:

A man of 41 was refused permission to start work in a factory until he had been fitted with a truss. He was found to have only moderate Malgaigne's bulging over each inguinal canal, but no evidence of hernia was found. I communicated with the works medical officer by telephone, and was informed that he wished the man to wear a truss as a precautionary measure in case of possible hernia, and, while admitting that there was no sac coming down the canal or evidence of direct hernia, he insisted that a truss be worn. Now if I refuse a certificate that a truss is necessary the man loses his chance of a much-needed job. If, in order that he may obtain the employment and also claim some financial assistance from his approved society, I issue the certificate against my knowledge and belief, I am making a false statement.

It would be instructive to learn from someone with expert knowledge of such matters the answers to the following questions which arise from this situation. (1) Does the wearing of a truss prevent the occurrence of a hernia? (2) Is not the wearing of a truss likely to lead to pressure atrophy of the musculature and thus predispose the wearer more than ever to the condition he is desirous of avoiding? If the answer to the latter be "Yes," then one would not be justified in recommending a truss. If the answer to the former question be "Yes," then I shall feel happier in dealing with another such situation. At present, however, I am not convinced that I am justified either in recommending a measure which I consider unnecessary or in jeopardizing my patient's chance of good employment. I have been unable to find any reference in the literature at my disposal to the prophylactic use of trusses, and I shall be grateful for the observations of any correspondents who may care to advise me on the points raised.—I am, etc.,

Crewe. E. MARCUS LIDDLE.

Oxytocic Injections by Midwives

SIR,—Faced with post-partum bleeding from an atonic uterus one's first action is to give a hypodermic injection of one of the oxytocic drugs, and in most cases the bleeding is thus controlled and disaster averted. After such an experience I have

often reflected on the disadvantages under which our forefathers practised before the introduction of hypodermic medication.

The majority of women are confined at home under the supervision of State-certified midwives, most of whom are employed by the local authority, and as such municipal midwives are expressly forbidden to possess or carry a hypodermic syringe they are not better able to deal with an atonic uterus than was the midwife in the days of William Smellie. There is no need to stress the difficulties with which the district midwife has had to contend since the outbreak of war, and the increasing difficulty of obtaining medical aid in an emergency is likewise very evident. Under these circumstances there can no longer be any justification for failing to supply hypodermic syringes and ergometrine to midwives. The rules of the Central Midwives Board contain nothing to prevent or even discourage the midwife from giving hypodermic injections of oxytocics after the completion of the third stage, and as a practising obstetrician I can see no valid reason why a midwife may not have at her disposal the only certain method we possess of combating a dangerous, urgent, and not rare complication of labour.—I am, etc.,

W. J. CLANCY,
Obstetric Officer.

City General Hospital, Sheffield.

"B.M.J." in U.S.A.

SIR,—You will be interested to know, I think, that I have received every issue of the *British Medical Journal* in spite of hostilities. I give my *Journals*, after I have read them, to the library of the County Medical Society, of which I am a member, and, on recent check, not a one was missing.—With all good wishes, I am, etc.,

Kansas City, Missouri, Nov. 28, 1941. RICHARD SUTTON, jun.

Twining Memorial

SIR,—The Faculty of Radiologists proposes to establish a memorial to the late Dr. E. W. Twining of Manchester, and it has been decided that it shall take the form of a medal to be awarded biennially on the results of the examination for the Fellowship of the Faculty.

Dr. Twining was a great teacher and took a keen interest in the training of radiologists and the establishment of a higher qualification for them. It is therefore thought that such an award in his memory would be very appropriate. Contributions, which should not exceed three guineas, should be sent to the Honorary Treasurer, 32, Welbeck Street, London, W.1, and cheques made payable to "The Faculty of Radiologists."—We are, etc.,

S. COCHRANE SHANKS, President. S. WHATELY DAVIDSON.
B. W. WINDEYER, Hon. Treasurer. E. DUFF GRAY.
M. H. JUPE, Hon. Secretary.

Obituary

A. CLARKE BEGG, O.B.E., M.B.LOND., M.D.ED.

The death of Dr. Alexander Clarke Begg has taken a notable personality from the medical profession in South Wales.

Dr. Begg was born at Dunedin, New Zealand, of a well-known Scottish family, and had his medical education at Edinburgh. He came to Swansea as partner to the late Dr. R. C. Elsworth, and quickly made his mark as a sound and enterprising physician, turning entirely to consulting practice in 1920. He was elected to the honorary staff of the Swansea General Hospital in 1910, and became in due course senior physician in 1931. In the later years of his career he took a very active part in the administration of the hospital as chairman first of the house committee and then of the board of management, and in this capacity he was prominent in sponsoring a comprehensive contributory scheme, which has greatly benefited and stabilized the finances of the hospital. His capabilities in administrative work were fully recognized by his colleagues, and he was an active member of the B.M.A., serving as chairman of the Swansea Division for several years during the last war period, and in 1923-4 as president of the South Wales and Monmouthshire Branch. As a New Zealander he represented Fiji on the Council of the B.M.A. in 1932-3, and he was also a member of the Consultants Group.

Although stern in manner and very firm in his adherence to his considered views, he was eminently fair and judicial as a chairman, and when presiding over the hospital board he was always at pains not to allow his predilections as a medical man to carry undue weight; his fairness and firmness stood him in good stead in guiding the deliberations of a hospital board representing very varied interests and containing many types. Except for his professional and hospital activities he avoided public life, though well fitted to take part in it. Dr. Begg in his clinical outlook maintained a close touch with modern advances of medicine. He was especially interested in diabetes, and wrote a valuable concise handbook, *Insulin in General Practice*, published in 1924; this was based on his own extensive experience, and proved a helpful guide to a wide circle of doctors in the practical details of the new treatment. An abiding factor in his life was his faithful churchmanship, and in this field also he gave good service. His interest in that borderland where medicine and religion meet found expression in the writing of a little book on faith healing, in which he made it manifest that his training in the material aspects of his profession had not obscured for him the spiritual side of sickness and health.

Apart from his professional life Dr. Begg found relaxation in travelling, and twice revisited New Zealand, also attending the B.M.A. Annual Meeting held at Melbourne. He was a keen fisherman, walked much, and read widely, and he could thus bring to his talk with friends a range of experience and ideas which made his companionship a thing to be valued. In 1938, on reaching the age limit for his hospital appointment, he decided to retire and travel. He left Swansea, but subsequent events interfered with his plans, and a long illness shadowed his last year. He died in North Wales at the age of 69. Dr. Begg was twice married; his first wife died in tragic circumstances in a drowning accident in New Zealand. In 1936 he married Miss Rhona Snow, younger daughter of Lieut.-General Sir T. D. Snow, who survives him.

A. F. S.

L. W. DRYLAND, M.R.C.S., D.P.H.

We announce with regret that Dr. Leslie Winter Dryland, Knight of the Order of St. John of Jerusalem and Deputy Lieutenant for the County of Northampton, died on December 28 after many years of practice at Kettering, where he was senior partner in a firm of four, medical officer of health to the rural district council, and senior honorary medical officer to the Kettering and District General Hospital.

Born at Kettering on May 13, 1868, son of John Winter Dryland, J.P., M.R.C.S., he was educated at Uppingham School, at Bristol, and at St. Bartholomew's Hospital, taking the English Conjoint diplomas in 1891 and the D.P.H. some years later. Immediately after qualification he was appointed house-surgeon to the Derbyshire Royal Infirmary, and from 1892 to 1895 he served as junior and senior house-surgeon at the Northampton General Hospital, there laying the foundations for much useful surgical work in Kettering and its neighbourhood.

Dr. L. W. Dryland was a member of the British Medical Association for nearly fifty years. He served on the Organization Committee and on several subcommittees at headquarters in London, represented the North Northamptonshire Division at seven Annual Representative Meetings, and was chairman of the Division in 1922-3. He was also a Fellow of the Society of Medical Officers of Health. His younger brother is Dr. G. W. Dryland of Kington, Herefordshire.

PERCY FLEMMING, F.R.C.S.

Mr. Percy Flemming, formerly professor of ophthalmic medicine at University College, London, and consulting ophthalmic surgeon to University College Hospital and to the Royal London Ophthalmic Hospital (Moorfields), died

on December 19 at Upper Basildon, near Reading, where he had lived since his retirement from active practice.

He was born in 1863, and from University College School (then in Gower Street) he entered as a medical student at University College, graduating M.B., B.S.Lond. in 1887 with a university scholarship in medicine and honours in midwifery and surgery. He obtained the M.D. degree in 1888 and the F.R.C.S. diploma in the following year. From that point onwards he confined himself to diseases of the eye; he became clinical assistant at Moorfields, and was elected assistant ophthalmic surgeon to University College Hospital. When the surgical staff of Moorfields was enlarged in 1900 Flemming was appointed an additional surgeon, and served in that post for nineteen years; he was also for some time ophthalmic surgeon to the New Hospital for Women, which was later renamed the Elizabeth Garrett Anderson Hospital. He published a number of papers on the treatment of eye diseases in the *Transactions of the Ophthalmological Society*. In retirement at Upper Basildon he was able to renew his interest in archaeology, and prepared for the London Museum at Lancaster House a communication on the work of monastic infirmaries in mediaeval England. He was elected a Fellow of the Society of Antiquaries in 1931 and a member of the Reading Pathological Society in 1939.

We regret to announce the sudden death at St. Neots, Huntingdonshire, on December 15 of Dr. ERNEST HENRY HARRISSON at the age of 64. A native of Holbeach, Lincolnshire, he was educated at Boston Grammar School, at Clare College, Cambridge, and at the London Hospital, and graduated M.B., B.Ch. in 1902, after having taken his B.A. in the Natural Sciences Tripos of 1899. He proceeded to the M.A. and M.D. degrees in 1907. Before settling at St. Neots, where he held a number of appointments, he had been clinical assistant at the London Hospital and at the Claybury Asylum. During the last war Dr. Harrisson was medical officer to the local Red Cross hospital. In the *British Medical Journal* of December 1, 1935, he gave a clear-cut account of the delivery of the Eynesbury quadruplets, whose premature birth he attended on November 28. In the *Journal* of November 7, 1936, he described the successful rearing of these babies during the first nine months of their life.

Universities and Colleges

UNIVERSITY OF CAMBRIDGE

The Faculty Board of Medicine has appointed Dr. G. S. Graham-Smith, F.R.S., Dr. R. A. McCance, Dr. E. B. Verney, F.R.S., and Mr. W. H. Bowen, F.R.C.S., members of the M.D. Committee for 1942. The Board has also appointed Mr. D. V. Davies, M.A., an Awarder of the Marmaduke Sheild Scholarship for 1941-2.

UNIVERSITY OF LEEDS

Prof. M. J. Stewart, F.R.C.P., has succeeded Mr. Harold Collinson, M.S., F.R.C.S., as Dean of the Faculty of Medicine, and Prof. Archibald Durward, M.D., has been appointed Academic Sub-Dean in the place of Prof. Stewart.

UNIVERSITY OF ABERDEEN

Dr. Helen M. Taylor has been elected a member of the business committee of the University General Council.

QUEEN'S UNIVERSITY, BELFAST

The following candidates have been approved at the examinations indicated:

M.D.—Margaret M. F. Robinson (with commendation), W. Calwell, J. H. P. Giff.

M.CH.—C. H. Cullen, K. C. McKeown.

M.B., B.CH., B.A.O.—W. Bingham, Agnes W. E. Black, J. S. Boyd, J. P. J. Burns, R. F. Campbell, W. J. F. Chambers, W. H. Crawford, N. F. Donaldson, Margaret A. Emerson, W. V. Glasgow, R. Glass, Muriel E. Gray, A. D. M. Hamilton, L. J. Higgins, M. W. Johnstone, B. G. Kelly, V. J. McCann, A. O. McClay, H. B. McDowell, T. C. T. McFetridge, T. R. Malloy, G. Maybin, B. A. Millar, G. McD. Nightingale, Eileen P. Patton, Mary N. M. Robertson, H. D. Rossiter, S. Ruttle, Kathleen Sides, J. A. Sinton, H. A. Smith, B. McC. Throne, T. Wilson.

ROYAL COLLEGE OF SURGEONS OF ENGLAND

At the last meeting of the Council of the Royal College of Surgeons of England it was decided to confer the Honorary Fellowship of the College on the Right Hon. Sir Earle Page, G.C.M.G., M.B., Ch.M., Minister representing the Australian Government in London, and lately Prime Minister of Australia; and on Prof. A. A. Jurasz, Dean of the Polish Faculty of Medicine in the University of Edinburgh, and lately Professor of Surgery in the University of Poznan.

Sir Earle Page was admitted at the Council meeting on January 8, and Prof. Jurasz will be admitted at a meeting of Fellows and Members on February 12.

The Services

COLONEL COMMANDANT, R.A.M.C.

Lieut.-General Sir James Hartigan, K.C.B., C.M.G., D.S.O., has been appointed Colonel Commandant, R.A.M.C., for 1942.

ARMY AWARDS

The King has made appointments and awards and has approved mentions in recognition of distinguished services in the Middle East (including Egypt, East Africa, the Western Desert, the Sudan, Greece, Crete, Syria, and Tobruk) during the period February to July, 1941. The following medical officers are included in the list.

C.B.E. (Military Division)

Brigadier (Temporary) C. Crawford-Jones, late R.A.M.C.; Colonel G. R. Lynn, D.S.O., I.M.S.; Brigadier K. MacCormick, D.S.O., N.Z.M.F.; Brigadier (Temporary) A. J. Orenstein, C.M.G., S.A.F.; and Colonel J. C. Sproule, O.B.E., late R.A.M.C.

O.B.E. (Military Division)

Major (Temporary Lieut.-Colonel) E. R. Boland, R.A.M.C.; Captains (Temporary Majors) A. A. G. Flemming and I. Gordon, R.A.M.C.; Major (Temporary Lieut.-Colonel) R. R. Leaning, R.A.M.C.; Major (Acting Lieut.-Colonel) A. Pain, R.A.M.C.; Colonel (Temporary) C. Popham, R.A.M.C.; Major (Temporary Lieut.-Colonel) R. C. Speirs, E.A.A.M.C.; Colonel (Temporary) D. Stewart, T.D., R.A.M.C.; and Colonel E. A. Sutton, M.C., late R.A.M.C.

M.B.E. (Military Division)

Captain (Temporary Major) W. J. G. Barrie, R.A.M.C.; Lieut. C. H. Bone, E.A.A.M.C.; Major W. A. Burki, I.M.S.; Captains C. B. Drew, E. L. Fawssett, C. R. Houghton, J. B. M. Milne, E. G. Morris, and R. S. Morton, R.A.M.C.; Lieut. M. E. M. Herford, R.A.M.C.; Lieut. (Temporary Captain) E. P. Rigby, E.A.A.M.C. (attached the King's African Rifles); Captain L. R. Wagholikar, Army in India Reserve of Officers (Medical); Lieut. (Temporary Captain) G. Watt, Gold Coast Field Ambulance; and Captain (Acting Major) J. Woodrow, R.A.M.C.

M.C.

Captain J. S. Lancaster, R.A.M.C.; Captains S. N. Chatterjee and L. Nandkeolyar, I.M.S.; and Lieut. S. S. A. Khan, I.M.S.

Mentions

Commands and Staff: Major-General (Temporary) P. S. Tomlinson, C.B., D.S.O., late R.A.M.C.; Brigadiers (Temporary) C. Crawford-Jones, C.B.E., D. T. M. Large, and J. Walker, M.C., late R.A.M.C.; Brigadier (Acting) R. E. Barnsley, M.C., late R.A.M.C.; and Colonels G. F. Allison, M.C., S. M. Hattersley, M.C., and H. J. A. Longmore, late R.A.M.C.

Royal Army Medical Corps: Brigadier (Local) E. D. Pridie, C.M.G., D.S.O., O.B.E.; Colonels (Temporary) J. S. K. Boyd, N. Cameron, R. P. Cormack, G. W. B. James, M.C., H. V. Leigh, G. S. McConkey, C. Popham, O.B.E., W. D. D. Small, and F. G. A. Smyth, C.B.E.; Brevet Colonel H. V. Walsh, T.D.; Lieut.-Colonels R. McKinlay, W. Russell, and A. Swindale; Majors (Temporary Lieut.-Colonels) G. A. E. Argo, O.B.E., M.C., P. J. L. Capon, R. K. Debenham, F. A. R. Hacker, W. D. Hughes, C. B. Levick, and P. Lloyd-Williams, T.D.; Major (Acting Lieut.-Colonel) A. N. B. Odbert; Captain (Acting Lieut.-Colonel) H. A. Crouch, O.B.E., M.C. (Reserve of Officers); Majors C. R. Croft, J. B. S. Guy, and W. H. Milligan; Captains (Temporary Majors) J. M. Black, J. W. Crofton, A. H. T. F. Fullerton, P. D. C. Kinmont, W. G. Macfie, M. M. Medine, E. F. S. Morrison, H. N. Perkins, R. A. Smart, R. A. Stephen, S. M. Vassallo, J. M. Corall, R. D. Holloway, A. C. Rumsey, and J. P. Springett; and Captains L. V. Arundel, F. B. Brown, A. G. Carmichael, N. F. Coghill, A. J. Daly, R. T. Fletcher, W. G. France, R. P. Hendry, R. P. Lawson, J. H. B. Livingston, H. J. McCann, R. J. Niven, M. G. Pearson, E. J. Richardson, J. W. Spence, and J. A. G. Wilson.

Indian Medical Service: Colonel C. B. Ashton; Lieut.-Colonels B. das Khurana, H. R. B. Gibson, R. A. Logan, O.B.E., K. S.

Master, M.C., and D. Sanyal; Majors D. Datt, A. Singh, M. K. Afridi, and H. W. Farrell; Captain (Temporary Major) K. Satyanarayana; Captains G. B. Jackson, A. K. Maitra, H. C. Rogers, and R. Y. Taylor; and Lieuts. K. S. Pillai, T. S. H. Silvester, V. F. Siqueira, and V. Rangachari.

Indian Medical Department: Jemadars P. C. Ray, R. N. Thurkral, and S. Singh; Assistant Surgeon L. C. Emmett; and Sub-Assistant Surgeon T. G. Wrafter.

Indian Hospital Corps: Jemadar S. P. Chaturvedi.

Gold Coast Field Ambulance: Lieut.-Colonel J. M. Mackay, M.C.; and Captains W. R. Phillipps and H. G. H. Waters.

East Africa Army Medical Corps: Colonels C. H. Marshall and A. D. J. B. Williams; Lieut.-Cols. T. F. Anderson and J. C. R. Buchanan; Majors (Temporary Lieut.-Colonels) D. Bell and S. W. T. Lee; and Captain J. McC. Caldwell.

CASUALTIES IN THE MEDICAL SERVICES

ROYAL NAVY

Missing

Surgeon Lieut.-Commander Robert Douglas Johnston, R.N.

SOUTH AFRICAN MEDICAL CORPS

Captain JOHN JAMES FRASER RUSSELL, the elder son of Sir Alexander Fraser Russell, Chief Justice of Southern Rhodesia, and Lady Russell, was killed in action in December. He was educated at the University of Edinburgh, where he graduated M.B., Ch.B. in 1933. For a time he held the post of railway medical officer at Broken Hill. He was a member of the British Medical Association.

EPIDEMIOLOGICAL NOTES

Discussion of Table

The incidence of infectious diseases in England and Wales declined considerably during the week. The decrease in the number of notifications of scarlet fever, whooping-cough, diphtheria, and measles was 172, 151, 197, and 176 cases respectively. Exceptions to the general trend occurred in several areas, and there was a rise in the notifications of scarlet fever in Wales, Yorkshire, and the West Midland counties. A fall in the figure for whooping-cough has been recorded for five consecutive weeks; the total for the week under review shows a reduction of 25% on that of six weeks earlier, but during this period the incidence in the counties of Essex, Suffolk, Norfolk, and London has tended to increase. A further rise in the notifications of measles was recorded in Surrey, the figures for the past four weeks being 44, 71, 68, and 100; for the previous eight weeks the weekly figure had only varied between 6 and 16. A small increase was recorded for paratyphoid, 2 cases, and typhoid, 6 cases. Fourteen of the 22 cases of typhoid notified during the week were in Northumberland, Castle Ward R.D.

Forty-two of the 52 cases of measles reported from Scotland occurred in Edinburgh. The rise in the notifications of cerebrospinal fever was due to the experience of Glasgow, where there were 19 cases, compared with 8 in the preceding week.

Dysentery

There was a relatively large increase, 41, in the number of notified cases of dysentery in England and Wales, but only one new outbreak of any size was recorded—10 cases in Cornwall, Bodmin M.B. Forty-three cases were notified in Nottingham, East Retford R.D.; in this area, where there were no cases in the preceding week, there were 38 during the week ending December 6. The only other county with a relatively large number was Yorkshire, West Riding, with 15 cases: these were scattered throughout the county, with multiple cases in Bradford C.B. 4, Huddersfield C.B. 3, Sheffield C.B. 2, and Doncaster R.D. 3.

Three-quarters of the cases notified in Scotland were contributed by four cities: Aberdeen 9, Dundee 6, Edinburgh 10, and Glasgow 6.

Returns for the Week Ending December 27

The notifications of infectious diseases during the week included scarlet fever 997, whooping-cough 1,124, diphtheria 845, measles 540, pneumonia 751, cerebrospinal fever 95, poliomyelitis 11, and dysentery 93.

No. 51

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended December 20.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1941 (a)	(b)	(c)	(d)	(e)	1940 (Corresponding Week) (a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	110	4	32	—	5	133	11	32	1	3
Deaths		—	1				2	4		
Diphtheria	1,006	38	310	38	29	1,378	64	485	32	40
Deaths	43	3	6	5	—	39	2	11	3	1
Dysentery	146	14	43		—	152	23	17		—
Deaths			—	—	—			2	—	—
Encephalitis lethargica, acute	5	—	1		—	16	—	—		—
Deaths		—	—				—	—		
Enteric (typhoid and paratyphoid) fever						16	1	3	21	—
Deaths						1	—	—	1	—
Erysipelas		—	56	9	3		37	59	6	5
Deaths		—	—				—	—		
Infective enteritis or diarrhoea under 2 years										
Deaths	39	4	9	6	3	24	1	5	3	1
Measles	710	28	52	36	4	15,221	448	288	—	51
Deaths	1	—	1	1	—	16	1	5	2	—
Ophthalmia neonatorum	65	2	15		1	50	1	12		1
Deaths										
Paratyphoid fever	19	3	9	—						
Deaths	—	—	—	—						
Pneumonia, influenzal*	903	51	8	2	7	970	63	8	3	11
Deaths (from influenza)	33	4	4	—	—	30	6	4	2	1
Pneumonia, primary	—		216	8				248	11	
Deaths		34		9	8		68		10	10
Polio-encephalitis, acute	2	—				3	—			
Deaths		—					—			
Poliomyelitis, acute	11	—	1	7	—	13	—	3	—	—
Deaths		—	—				—	—		
Puerperal fever	—	2	10	2	—	2	2	10	4	—
Deaths		2					—			
Puerperal pyrexia	170	8	11		1	106	3	12		1
Deaths										
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	1,220	35	252	48	26	1,496	93	225	62	40
Deaths	1	—	—	—	—	3	1	—	—	—
Small-pox	—	—	—		—	—	—	—		—
Deaths		—	—	—	—		—	—	—	—
Typhoid fever	22	—	2	8	—					
Deaths	1	—	—	—	—					
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths			—	—	—			—	—	—
Whooping-cough	1,564	220	62	31	9	2,935	40	206	—	23
Deaths	15	5	—	—	—	16	—	5	2	—
Deaths (0–1 year)	402	34	81	26	14	317	23	74	24	22
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	4,483	589	620	187	112	5,944	889	690	196	134
Annual death rate (per 1,000 persons living)			13·5	12·4	†			14·0	13·1	11·7
Live births	4,830	428	792	333	228	4,547	267	815	236	174
Annual rate per 1,000 persons living			16·1	22·1	†			16·5	15·8	15·2
Stillbirths	175	16	29			204	14	32		
Rate per 1,000 total births (including stillborn)			35					38		

* Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

† Owing to evacuation schemes and other movements of population, birth and death rates for Northern Ireland are no longer available.

Medical News

Dr. Charles Metcalfe Brown has been appointed Medical Officer of Health for Manchester in succession to Dr. R. Veitch Clark, who is due to retire this year after twenty years' distinguished service in that post. Dr. Brown is at present M.O.H. and school medical officer for Middlesbrough and port medical officer for the River Tees.

Sir Farquhar Buzzard will deliver a lecture on "Hospital Regionalization" at the Weston Hotel, Bath, on Thursday, January 15, at 5.30 p.m. All Service medical officers and civilian practitioners will be welcome.

A meeting of the Diagnosis Section of the Faculty of Radiologists will be held at 32, Welbeck Street, W., on Friday, January 16, at 11 a.m., when a paper will be read by Mr. A. Dickson Wright on "Lesions of the Intervertebral Disks," and Major Hugh Davies will present a report on a series of head injuries investigated by air encephalography. Discussions will follow. On Saturday, January 17, at 10.15 a.m., the Therapy Section will discuss "The Constitutional Effects of Radiation, with Special Reference to Volume Dose."

Sir Wilson Jameson, Chief Medical Officer of the Ministry of Health, delivered the Cutter Lecture on Preventive Medicine at Harvard Medical School during a recent visit to America, his subject being "Public Health in Britain at War."

The December number of *Industrial Welfare and Personnel Management*, the journal of the Industrial Welfare Society (14, Hobart Place, S.W.1), includes an account of an industrial surgery in a sugar refinery and the value of the surgery in reducing lost time; an article on industrial legislation; the first of a series of articles on different types of hostel; and some notes describing the chiropody services provided by various firms for their workers. An editorial headed "Doctors in Industry" discusses appreciatively the report of the B.M.A. Committee on Industrial Health in Factories.

General F. A. Maguire, Director-General of Australian Medical Services, recently stated that 90% of Australia's supply of instruments were now manufactured within the Commonwealth, against a former 25%.

Letters, Notes, and Answers

All communications in regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, W.C.1.

ORIGINAL ARTICLES and LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone unless the contrary be stated.

Authors desiring REPRINTS of their articles should communicate with the Secretary, B.M.A. House, Tavistock Square, W.C.1, on receipt of proofs. Authors over-seas should indicate on MSS. if reprints are required, as proofs are not sent abroad.

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B.M.A. SCOTTISH OFFICE: 7, Drumsheugh Gardens, Edinburgh.

QUERIES AND ANSWERS

"Unquestionable" Diagnosis of Pulmonary Tuberculosis

"MORAVIA" writes: Will you please quote on what medical grounds a case of pulmonary tuberculosis can be so diagnosed and unquestionably accepted as "pulmonary tuberculosis" in the eyes of the law of England.

Gum of Postage Stamps as a Germ Carrier

Dr. JAMES F. BLACKETT (Bloomfield Park, Bath) writes: Mr. A. E. Sawday (December 6, p. 836) may like to know that the late Dr. Newman Neild, when he was on the honorary staff of the Bristol General Hospital, made some investigations on this subject. He published his results in collaboration with Dr. E. V. Dunkley, under the title "The Role of the Saliva in the Transmission of Tubercle," in the *Lancet* of April 17, 1909 (p. 1096). They urged as the result of their observations that all patients with pulmonary tuberculosis, at any rate, should be forbidden to close envelopes and stick stamps with their saliva, and forbidden to moisten their fingers with saliva for any purpose whatsoever; and said in conclusion: "Surely it is not too much to ask that wherever there is an inkpot there should be gum or a finger damper, and that it should be taught in all schools that moistening the fingers with saliva is a dirty habit and a habit that is fraught with danger both to the possessor and to others."

Malaria Illustrated by Cinematograph Film

In reply to the inquiry by Dr. P. A. Steven (December 6, p. 836) we are informed that copies of the film dealing with the control of malaria described in the *Journal* of November 15 (p. 707) can be obtained in 35 mm. or 16 mm. size for private screening on application to Technical Products Limited, Lensbury Close, Kingston Road, Teddington.

Income Tax

Expenses of Removal

A. K. asks: Will the Inland Revenue authorities allow as deductions such expenses, actually incurred in a removal owing to enemy action, as removing and refitting professional equipment, apparatus, furniture, etc.?

*** Yes—provided, of course, that substantially the same and not a different practice is carried on from the new address.

Practitioner on Active Service

G. L. enlisted in September, 1939, and is now working under the Ministry of Pensions. His practice is being carried on by "A" (referred to as "the incoming doctor"), G. L. continuing to receive one-half of the panel fees. How should G. L. be assessed for 1939-40 and 1940-1?

*** The position of the "incoming doctor" is not quite clear, but we assume that he may be regarded as an employee rather than as a partner of G. L. On that basis G. L. continues liable to assessment on the basis of the previous year's profits (deducting as expenses the sum paid to "A"); but if in either year his actual aggregate income is not more than four-fifths of the aggregate income as assessed, then he is entitled to have his liability based on the current and not the preceding year's earnings.

LETTERS, NOTES, ETC.

Thyroid for Chilblains, Vitamins, etc.

Dr. M. E. LAMPARD (Colchester) writes: There were two articles in your issue of December 13 which were full of interest to the general practitioner—the second Holme Lecture by Sir Thomas Lewis on chilblains and allied conditions (p. 837), and the paper on some effects of vitamins B and C on senile patients by Drs. W. Stephenson, C. Penton, and V. Korenchevsky (p. 839). It has been observed that chilblains may sometimes ensue after partial thyroidectomy, and thyroid extract will often cure them. Unlike most drugs, thyroid extract may be given in big doses at first, and then cut down when the effect has been noted, because it is impossible to poison anyone with therapeutic doses of thyroid extract in a few days. I find that giving from 4 to 6 grains of the dry gland daily for a fortnight until the pulse rate has been raised by about 20 per minute will usually cure chilblains, and the cure can be maintained on a considerably smaller dose.

As regards vitamin B, it does not seem to be very widely known that the richest and cheapest source of this is wheat germ. The germ of the wheat is separated by the millers, and is sold for about 4d. a pound. It has in the past been given to cattle. One ounce of wheat germ will supply the body for sixteen hours with a sufficient quantity of vitamin B, if one takes its content of B, as the standard. It is a flaky substance, and can be sprinkled on porridge or cornflakes, or stewed fruit, and may be advantageously incorporated in scones and cakes in the proportion of about 1/2 oz. to 1 lb. of flour. As a source of vitamin B it is far more acceptable to the palate than yeast. One ounce of wheat germ also contains 2 mg. of iron, and of course a large quantity of vitamin E.

Corrigendum

In the review of Dr. Simson Hall's book *Diseases of the Nose, Throat and Ear* (December 20, p. 877) it was stated that the excellent coloured plate showing diseases of the tympanic membrane—the frontispiece of the first edition—had been eliminated. This illustration has, in fact, been inserted facing page 322 in the section dealing with the tympanic membrane. With regard to the criticism of Fig. 25, which shows puncture of the antrum, closer inspection of the photograph discovers a nasal speculum in the operator's left hand at the upper level of the patient's forehead.